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Leon's Kimasthene.

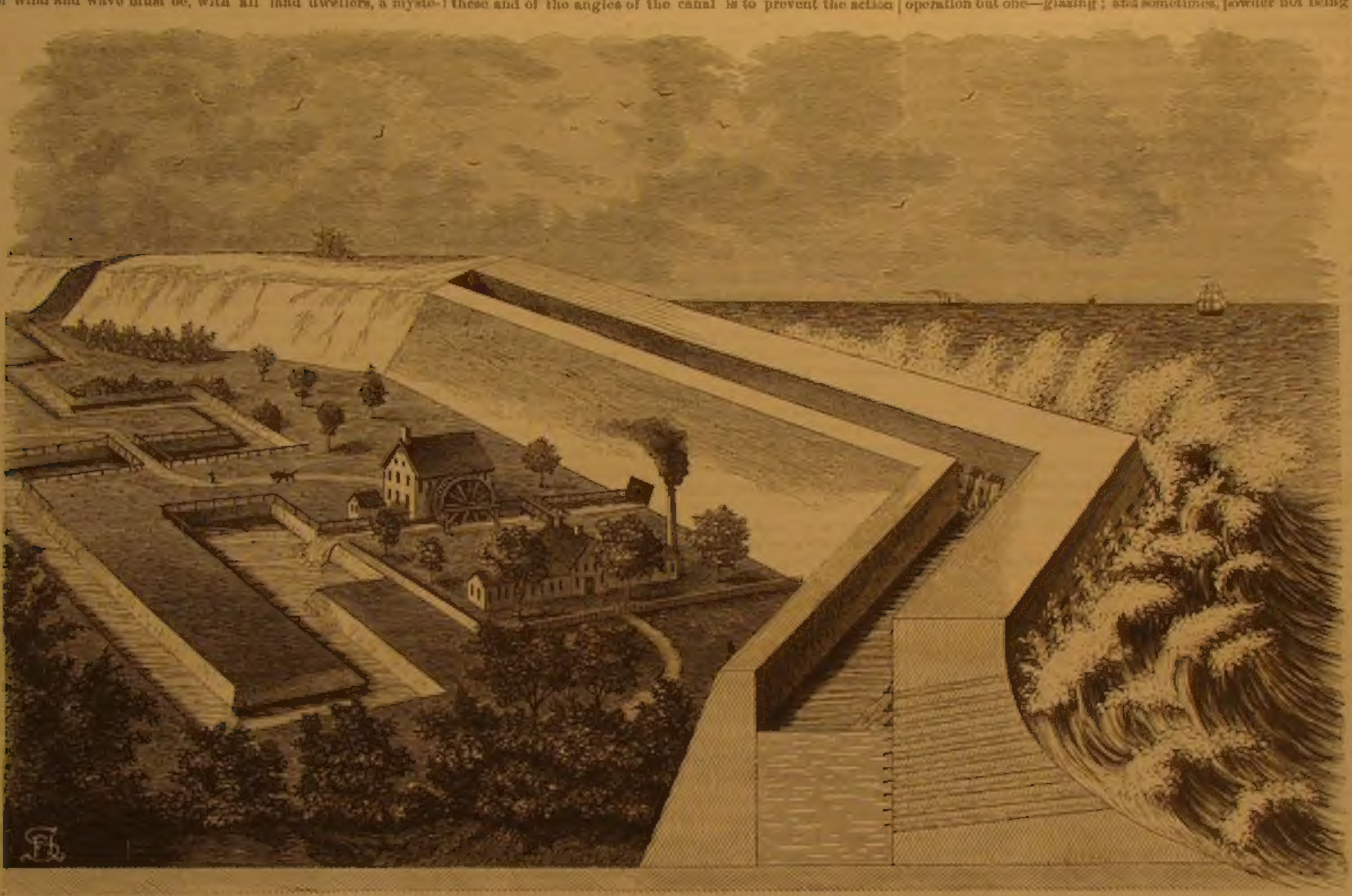
People who live on the land and never visit the seashore or brave the dangers of a sea voyage, have very incompetent ideas of the force of combined wind and water. The force of a mass of water, as a wave thirty or forty feet high, moving even at a slow rate may be imagined, and possibly some idea of its effects on an obstacle in its course estimated from the descriptions of travelers; but the fact of the immense force of wind and wave must be, with all land dwellers, a mystery. It has been stated that the waves of the Atlantic, the "stormy ocean," are at their fiercest, only thirty feet high; from our experience we incline to a much higher figure.

This, however, is merely the wave on the wide ocean without an obstacle to resist its course, but when sufficient resistance is offered, it is wonderful how high the wind's force will carry the water. We remember the storm of April, 1851, which swept away the Minot's Ledge lighthouse, off Cohasset, Massachusetts, and lasted three days and nights. We then, from Lynn beach, saw the waves carried up the face of the rocks, off the peninsula of Nahant, sixty feet high, and at least twenty feet above, and thrown in spray over the land. At the entrance of the Cromarty Firth, Scotland, the waves, in a northeast storm, meeting the obstacle of the precipitous rock known as the "South Sutor," rise to its top, not less than one hundred and ten, or one hundred and twenty feet. The object of the plan shown in the accompanying engraving is to utilize this uplifting power of the wind-driven water for purposes beneficial to man. If waves impelled by the winds will leap up precipitous rocks, they will rise much higher when the surface on which they strike is curved to present an easy ascent. Such is the design of the breakwater shown in the engraving.

It is the invention of a Spanish engineer, J. Ruiz Leon, and was patented in the United States, March 30, 1869. He describes its construction and operation substantially as follows: On the sea coast he raises a hollow dike, the exposed face of which is curved, the base being an inclined plane continued several feet below the sea level, and being pierced with a series of conduits, the inner ends of which are provided with valves opening to the inclosed space, or reservoir. These valves allow the entrance of the water from the surf, but prevent its escape to the sea as the wave retires. Thus a quantity of water passes into the reservoir at each uplifting of the wave. Within the dike may be erected mills of various kinds moved by water wheels driven by this stored-up power.

Now, to return this water to the sea the inventor proposes a canal of a zigzag course, leading from the tail race of the mill to the sea through the embankment, the canal at its debouchure widening and having a number of piers, arranged like the alternate squares on a chess board. The object of these and of the angles of the canal is to prevent the action of the waves and to allow the water to be discharged at the ordinary ocean level. Already has this plan been successfully applied on the island of Cuba. Where the tides are insignificant in hight this device yields the best results. Where the tide creates great differences of level it is necessary to modify somewhat the plan, by placing the wheel on a floating platform or raft. The patentee thinks that it will not be difficult to create a power by his plan that will be equal and continuous all the year round; a simple method being to store up water raised in storms in a reservoir to be used in seasons of comparative calmness.

Further information may be gained by addressing J. Ruiz Leon, care of J. N. Paulding, 30 Broadway, New York city.



LEON'S KIMASTHENE, A PATENT CONTRIVANCE FOR USING WAVE POWER.

THE SCHULTZ WHITE GUNPOWDER.

We condense from an English exchange a description, of the white, or rather, tawny-colored powder lately devised by Captain Schultze of the Prussian service, and which, under the auspices of at least one London gunmaker, is finding large application among English sportsmen. The progress of manufacture is said to be most safe, as it is most ingenious. Only at the final stage of making this gunpowder is the process subject to any explosive contingency. In illustration of this, the following circumstance should be stated; in July, 1868, the manufactory of Captain Schultze at Potsdam, near Berlin, was consumed, burned quietly to the ground—burned, not exploded. The accident is altogether unprecedented; nothing like it could have happened to a manufactory of common black gunpowder.

We now come to the process of manufacture. The inventor begins by taking any of the common woods (he keeps the woods steeped in water) which have acquired celebrity for yielding gunpowder charcoal, and sawing them transversely into plates of the required thickness by a veneer saw. The plates, when sliced, are laid under a manifold punch and submitted to pressure, whereby grains of not merely definite and varying size, but definite and unvarying shape (a matter of some moment as influencing the constancy of impaction), result. Grains are thus evolved at the very commencement of the manufacturing operation, unlike what happens in the case of black gunpowder, wherein the operation of grainage is the last operation but one—glazing; and sometimes, powder not being invariably glazed, the last absolutely. The punched grains, being collected in a mass, are subjected to a treatment of chemical washing, whereby calcareous and various other impurities are separated, leaving hardly anything behind save pure woody matter, cellulose or ligaine. The next operation has for its end the conversion of these cellulose grains into a sort of incipient xyloidine, or gun-cotton material, by digestion with a mixture of sulphuric and nitric acids. Practically it is found that absolutely perfected xyloidine (of which ordinary gun-cotton is the purest type), not only decomposes spontaneously by time, the chief products of combustion being gum and oxalic acid, but it is moreover liable to combustion of a sort that may be practically called spontaneous, so slight and so uncontrollable are the causes sufficing to bring it about. Cellulose, or woody matter, otherwise termed ligaine, partially converted to xyloidine, is, Captain Schultze affirms, subject to neither of these contingencies. Chemists will understand that, inasmuch as the wood used as a constituent of the Schultze gunpowder is not charred, its original hydrogen is left, and by and by, at the time of firing, will be necessarily utilized towards the gaseous propulsive resultant. Next, washed with carbonate of soda solution and dried, an important circumstance is now recognizable.

The grains, brought to the condition just described, are stored away in bulk, not necessarily to be endowed with final explosive energy until the time of package, transport, and consignment. Only one treatment has to be carried out, and it is very simple. The ligneous grains have to be charged with a certain definite percentage of some nitrate, which is done by steeping them in the nitrate solution and drying. Ordinarily a solution of nitrate of potash (common saltpeter) is employed; but in elaborating certain varieties of white powder Captain Schultze prefers and uses nitrate of baryta.

Having traced the new powder to its final stage, we may

contemplate it under the light of two distinct scrutinies—theoretical and practical. Review of the chemical agencies involved, or that may be evolved, suggests the reaction, especially under prolonged moisture, of the sulphur and niter of ordinary powder, whereby sulphide of potassium should result. Practice is confirmatory; under the condition indicated, sulphide of potassium, more or less, does result, and proportionate to the extent of decomposition is the powder deteriorated. Inasmuch as the Schultze gunpowder is wholly devoid of sulphur, so is the particular decomposition adverted to impossible; and theory, at least, fails to suggest any other decomposition as probable or even possible.

The specific gravity of the Schultze gunpowder may be roundly taken at half the specific gravity of ordinary gunpowder; or, in other words, for equal weights of the two, the bulk of Schultze's powder will be double that of its rival. Hereupon an important question is raised, the drift of which will be obvious to any practical gunner. Is the available projectile force of one volume of Schultze's powder equivalent to the available projectile force of two volumes of black powder? If not, it may be averred with tolerable confidence that the new material could never come into extensive practical use as a gunnery-projectile.

This consideration seems to have been duly considered by Captain Schultze. His powder is so devised and elaborated that each effective charge shall occupy equally the same space as a charge of common powder would have occupied. All his gunnery arrangements, therefore, are taken on the basis of matching volume against volume, the equivalent in weight to one volume of his powder being two volumes of ordinary gunpowder. It has taken fair hold on the English sportsman's appreciation, as before stated; but, as may be assumed, there are drawbacks, real or alleged, to its use, otherwise it would have gone further than it has to replace ordinary black powder. The chief disparagement alleged against it, is the difficulty, rather than the impossibility, of measuring out charges with the accuracy needful to practice. It is necessary to weigh the charges, gunmakers aver, if identity of result be contemplated. This allegation, if well borne out, implies a serious defect. Practical people will grasp its full purport, however much the unpracticed may make light of it.

BEET ROOT SUGAR.

No. IX.

TECHNOLOGY.—PART VI.

CONCENTRATION OF THE JUICE.

The concentration of the juice of the beet root to the point at which the sugar will most readily crystallize, is not effected in a single operation, but in two or three successive ones, separated by filtrations.

This concentration or evaporation of the juice of the beet is effected in most modern factories by means of vacuum pans, which, if not identical, are analogous to the one described and illustrated by us in our last article. The theory of the vacuum pan is very simple, being based on the fact that the juice boils at a temperature of about 212° Fah. under the pressure of the atmosphere (15 lbs, to the square inch), and that as this pressure is relieved, so is the boiling point proportionately lowered. By causing a partial vacuum within the pans containing the liquid to be evaporated, the pressure is thus reduced below that of the atmosphere, and it becomes possible to boil the juice at temperatures much below 212° Fah. The heating being done by steam it will be seen that, if, for instance, we make use of waste or exhaust steam from the engine and "returns," which has a temperature of at least 212° Fah., for the boiling of the juice in the first pan with no vacuum at all, this steam will, after it has left this first pan, and although it has lost a portion of its original heat, still retain enough of it, say 190°, when it has penetrated into the next pan, as will boil the juice in this second pan in a comparatively slight vacuum, and will, after having been used here, still retain heat enough, say 150° Fah., to boil the liquid in the third pan under the influence of a still more perfect vacuum.

In our practice the concentration of the beet root juice is nearly always effected by means of exhaust steam, costing nothing, and in a series of pans with respectively increasing vacuums. The time it takes to bring the juice to a certain degree of concentration depends upon the temperature of this juice, on that of the steam used for boiling it, on the extent of heating surface, and on the degree of vacuum within the pans. An increased heating surface, a more perfect vacuum, or hotter steam accelerates evaporation, and as a corollary, the larger the heating surface and the more perfect the vacuum the less heat will be needed in the steam. The greater the difference of temperature between that of the juice and that of the steam, the more rapid will be its transmission through the pipes or coils of the apparatus. The pressure in the last pan is reduced, that is, a partial vacuum formed, by injecting cold water into a condenser, which, through a wide pipe, is placed in direct communication with it. As at first, however, when the boiling is begun, the pans and heating spaces are filled with air which the injection water will not condense, and which it is essential to draw off; this is done by means of an air pump communicating with the condenser. This pump, when subsequently the boiling is in full activity, is used for the purpose of extracting the spent steam and water of condensation, which preserves the vacuum within the pans. The injection cock must necessarily be closed while the pump is drawing the air out of the pans.

A vacuum must be caused, not only in the upper bodies of the pans, but also in the heating or steam space, and these are all connected for this purpose with the condenser by means of special conduits.

As soon as the juice begins to boil in the first pan, the vapor and steam drive the air out of the body of the first pan into the second. As soon as the liquid in the body of the second begins to boil, its vapor and steam drive the air from the second into the third body, and when, lastly, the third pan begins to boil, its contained air, steam, and vapor are carried off directly into the condenser, and drawn out of it by the pump. The injection cock of the condenser must be slightly opened just at the moment when the juice begins to boil, in pan No. I., or as soon as the steam from No. II. reaches the condenser; this cock is then gradually opened wider and wider as the juice boils successively in pans Nos. II. and III., and is left wide open during the subsequent regular working of the whole apparatus. The air pump is also allowed to continue doing some amount of work through its cock being partially open.

Although the three pans are in direct communication with each other, and the condenser, a mean or average degree of vacuum is not produced through the whole apparatus, as might be supposed, but a different state of things exists in each separate body; the most perfect vacuum taking place in the last pan, while it is null or nearly so in the first. The cause of this difference is due to the variable speed of evaporation in the three pans.

If the "return" steam used for heating the pans has a temperature of over 212° Fah. no vacuum is needed in the first body, as it would cause the ebullition to be too violent and the contained liquid to "prime." If, however, the temperature of this steam be 212°, or lower, a partial vacuum has to be produced in the first body by means of a special pump acting on the second body.

In practice the liquid in each of the three pans has a different density, the thinnest being found in the first body, and the most concentrated in the last body. The process of evaporation is continuous through the whole system, the juice flowing constantly into the first pan while it runs out as "clear sirup" from the last pan, whence it is received in a *monte-jus*, which forwards it to its further destination. The vacuum causes the flow of liquids from one pan into the other, and also draws it into the *monte-jus*. For this latter purpose this *monte-jus* is connected with the condenser by means of a special pipe or simply by uniting it to the vapor chamber of the third pan.

The pump attached to the condenser for freeing it of steam and condensed water being at the same time employed to suck air, is for this reason called the "wet air pump." This pump cannot be too carefully constructed, and must be powerful in its action, so as to preclude all possibility of the rising of the water of condensation into the pans by its accumulation in greater quantities than can be drawn off in a given time. In many newly-erected sugar factories the "wet pump" is now entirely done away with, and the water of condensation disposed of by another appliance. For this purpose the condenser is placed at such a hight that the pipe for the egress of the water of condensation can be made to run down from a hight of from say 36 to 38 feet, while its lower extremity plunges into a small basin of water. This contrivance is connected with the upper portion of the condenser where a "*dry* air pump" needing very much less power than the "*wet* air pump," produces a partial vacuum. The water cannot rise in the pipe above the basin to a hight of more than 32 feet without overflowing, as it is balanced at this hight by the weight of the atmosphere; it forms, in fact, a real water barometer in which the water rises only to a hight determined by the extent of the vacuum caused by the injection water in the condenser, but which can never exceed 32 feet.

This is a simple, cheap, and efficient contrivance, which we highly commend to both sugar manufacturers and refiners.

The triple-effect pans have latterly been, to a considerable extent, replaced by "double-effect" pans, heated by exhaust steam alone, and are found to work satisfactorily. Their heating surface is calculated at one square foot for every 100 lbs. of beet root worked up per day, so that it would require 1,500 square feet of heating tube surface for the pans of a 150,000 lbs. per diem factory.

The modern arrangements for obtaining tight joints and for allowing the cleaning of the pipes, have, thanks to rubber plugs and rings, been much improved on in recent times.

Without entering into lengthy details, which could only find their place in a complete treatise on the manufacture of sugar, we cannot possibly describe the many dispositions which have been given to the bodies of vacuum pans (which are often horizontal instead of upright, as we have shown them in Robert's arrangement), nor can we either indicate the variations in the form and construction of condensers and of their pumps. We advise persons who might wish to establish a beet root sugar factory to have their vacuum pans and necessary apparatus made by only a first-class manufacturer of *beet root sugar* apparatus, one whose reputation and business depends entirely on his keeping pace with all the most recent improvements. Several such firms in Europe have acquired in this connection a world-wide celebrity, and some of them have agents in this city, from whom all desired information can easily be obtained.

As a general rule in practice, the "return" steam is admitted into the first body of the vacuum pan with a temperature of about 220° Fah., into the second with a temperature of about 172° Fah., and into the third with a temperature of about 154° Fah.

The heating surface in square feet needed for the concentration of the liquids in vacuum pans is calculated on the basis of from 15 to 20 lbs. of water evaporated by every square foot.

The "first" or "clear sirups" run out of the pans must mark from 24° to 28° Baumé. In order to gain all possible advantages, the pipes and internal coatings of the heating apparatus must be kept bright, clean, and free from scale.

If violent "priming" takes place, which must be constantly watched for, a small quantity of melted grease is run on to the upper surface of the boiling liquid, through small grease cocks, this allays the tendency to foam. Grease must be used as sparingly as possible, as it interferes materially at a later period, with both the action of the bone black in the filters and the "boiling down" of the sirups.

The sirups marking 24° to 28° Baumé are collected into the *monte-jus*, and are from thence conveyed to the reservoirs of the filters, and from these through the bone black in the filters, in a manner we shall describe in our next article.

It is then ready to be taken to a second vacuum apparatus, single, double, or triple, where it is further concentrated to a consistency, which is generally indicated by a density of from 40° to 42° of Baumé's areometer.

The less dense are the concentrated second sirups after boiling down, the larger will be the grain produced from them; and on the contrary, the denser these "second sirups" the smaller and finer will be the size of the grains or crystals of sugar subsequently produced from them. In order to obtain large and even-sized, regular-shaped crystals the boiling in the second vacuum apparatus must be carried on slowly and quietly.

The right degree of concentration is practically known to a good sugar boiler by the "thread" test. This consists in taking up between the thumb and fore finger a small quantity of sirup and drawing it out as a thread by spreading the fingers. The length this thread attains before breaking, and the "hook" it makes at its broken ends allow of his judging very accurately when the sirup has reached the desired consistency.

From the boiling pans the second sirups are taken to vats, tanks, or "crystallizers," where the sugar is left to deposit itself in a solid form, which afterwards allows of its being freed from the surrounding liquid molasses.

The specifications for the evaporating and boiling department of a beet root sugar factory working 150,000 lbs. of beet per day, would be as follows:

1. A triple effect copper vacuum pan, with condenser and all fixtures complete, and 1,200 feet of heating surface, sufficient for the working of 100,000 lbs. of beets per day. Cost, $4,800.

2. One horizontal wet air pump, with its special 10-horse power engine. Cost, $1,460.

3. One iron vacuum pan, boarded with wood, triple coil pipes, with heating surface of 200 feet and capacity of 250 cubic feet, with cast-iron condenser. Cost, $2,200.

4. One horizontal wet air pump, with its special 6-horse power engine. Cost, $1,040.

5. Two iron coolers, each of a capacity of 750 gallons. Cost, $320.

6. Four reservoirs, each of a capacity of 1,000 gallons, and one *monte-jus* of a capacity of 60 cubic feet. Cost, $250.

Total cost, in gold, of the concentration and boiling department of a 500-acre beet root sugar factory. Cost, $10,070.

The filtration department of this same establishment would comprise:

1. Seven filters, 15 feet high, double-bottomed, with syphon tubes, copper pipes, juice, and water cocks, etc. Cost, $2,000.

2. An "organ" set of pipes and cocks for distribution of juice, sirup, water, and steam. Cost, $350.

3. A triple gutter above and one single gutter below. Cost, $250.

4. Two feed reservoirs, each of a capacity of 750 gallons, with their cocks, etc. Cost, $110.

5. Three reservoirs, each of a capacity of 280 gallons. Cost, $300.

Total cost of the filtering department, in gold, $2,910.

Commercial Value and Purity of Coal Gas.

The commercial value and purity of coal gas depend:

1. On its illuminating power.
2. On its freedom, to a certain extent, from ammonia.
3. On its freedom from sulphureted hydrogen.
4. On its freedom, to a certain extent, from sulphur in any form other than sulphureted hydrogen.
5. On its freedom from carbonic acid.

Illuminating Power.—It appears from documentary evidence that in the very early days of gas lighting the construction of burners was well considered, and the conditions necessary for the production of the best effect thoroughly understood, but in spite of the reiterated teachings of competent men, burners of erroneous construction have during many years been produced in great numbers. Forty-three years ago, Christison and Turner published a statement of their experiments, the conclusions deducible from which the author of this paper has summarized as follows:

1. That up to a certain maximum consumption for each burner, the light increases in a much greater ratio than the consumption of gas.

2. That for each burner there is a certain size of flame which is most economical—a corollary of the first proposition.

3. That in argand burners the size of the holes and their distance from each other are of the utmost importance. The holes should be so near to each other that the flame unites at its base. For gas sp. gr. 530 to 630, the holes should be 1-32d inch diameter and about 12-100ths of an inch apart. For gas of a higher gravity, the holes should be 1-50th inch diameter.

4. That the size of the central aperture of an argand exercises an important influence on the amount of light yielded.

5. That the greatest amount of light is obtained when the flame becomes tinged with yellow and is near to the point of smoking.

6. That the glass chimney should be proportioned to the size of the burner and the consumption desired.

7. That consumers, generally, cannot burn the gas in such manner as to produce the best effect, on account of the liability of the flames to smoke.

These propositions really comprise all that is known respecting the principles which should govern the construction of gas burners. The sixth proposition is impracticable of application. Narrow chimneys are apt to become partly fused and opaque, they are liable to frequent breakage, and flames inclosed in narrow chimneys are apt to smoke on the least disturbance.

Among the teachers on the subject of gas burners may be mentioned Clegg, Peckstone, Alex. Wright, Lewis Thompson, Dr. Letheby, and Henry Bannister. Alex. Wright stated that of burners equally suited for the gas, and consuming it at the same rate, the most advantageous is the argand, next the batwing, and then the fishtail. That the larger the quantity of gas properly consumed in a given time from a burner, the greater is the light given per cubic foot. That the best results arise with a well formed but flagging flame, and the worst with an irregular, wire-drawn flame. Lewis Thompson said in 1851, every burner has (1st) a certain fixed amount of gas which it will consume to advantage; and (2d) gives its maximum effect where the flame is on the point of smoking. That the quantity of light is greatest with the argand, and the intensity with the fish-tail. Poor or common coal gas should issue more gently than rich or cannel coal gas, and from burners with larger holes than those for the latter gas.

The yellow-tinged flame, the flagging flame, and the gentle current, all mean the same thing—viz., low pressure; and MM. Dumas, Regnault, Audouin, and Berard, have established as a general law "that the greatest illuminating power is obtained with low pressures, and the maximum light with pressures, equal to ·079 to ·12 of an inch head of water." They further state that batwing burners of the same diameter, burning the same quantity of gas, yield more light when the slits are wide —1-36th of an inch gave them the best results. The diameter of the burner should be proportioned to the desired rate of consumption, but is less important than the width of slit. That single jet burners are very disadvantageous. That a fishtail is not much superior to two single jets, with holes of the same diameter, if the holes be very small. That the fishtail is generally inferior to the batwing. That argand burners, of almost the same appearance, many require to burn double the quantity of gas to give the same quantity of light, which is dependant upon, 1st, the width of the jet holes or slit; 2d, on the number of holes; 3d, on the actual and relative dimensions of the apertures by which air gains access to the interior and exterior parts of the flame; 4th, on the hight of the chimney.—*Mechanics' Magazine.*

FORMATION AND PHENOMENA OF CLOUDS.

BY J. TYNDALL, LL.D., F.R.S.

It is well known that when a receiver filled with ordinary undried air is exhausted, a cloudiness, due to the precipitation of aqueous vapor diffused in the air, is produced by the first few strokes of the pump. It is, as might be expected, possible to produce clouds in this way with the vapors of other liquids than water.

In the course of some experiments on the chemical action of light, I had frequent occasion to observe the precipitation of such clouds in the experimental tubes employed. The clouds were generated in two ways. One mode consisted in opening the passage between the filled experimental tube and the air pump, and then simply dilating the air by working the pump. In the other, the experimental tube was connected with a vessel of suitable size, while the passage between the vessel and tube could be closed by a stopcock. The vessel was first exhausted. Turning on the cock the air rushed from the experimental tube into the vessel, the precipitation of a cloud within the tube being a consequence of the transfer.

The clouds thus precipitated differed from each other in luminous energy, which is, of course, to be referred to the different reflective energies of the particles of the clouds, which were produced by substances of very different refractive indices.

Different clouds, moreover, possess very different degrees of stability. Some melt away rapidly, while others linger for minutes in the experimental tube, resting upon its bottom as they dissolve like a heap of snow.

The clouds exhibit a difference in texture. A certain expansion is necessary to bring down the cloud. The moment before precipitation, the mass of cooling air and vapor may be regarded as divided into a number of polyhedra, the particles along the bounding surfaces of which move in opposite directions when precipitation actually sets in.

Every cloud particle has consumed a polyhedron of vapor in its formation; and it is manifest that the size of the particle must depend, not only on the size of the vapor polyhedron, but also on the relation of the density of the vapor to that of its liquid. If the vapor were light and the liquid heavy, other things being equal, the cloud particle would be smaller than if the vapor were heavy and the liquid light.

The case of toluol may be taken as representative of a great number of others. The specific gravity of this liquid is 0·85; water being 1·0, the specific gravity of its vapor is 3·26, that of aqueous vapor being 0·6. Now, as the size of the cloud particle is directly proportional to the specific gravity of the vapor, and inversely proportional to the specific gravity of the liquid, an easy calculation proves that, assuming the size of the vapor polyhedra in both cases to be the same, the size of the particle of toluol cloud must be more than six times that of the particle of aqueous cloud. Aqueous vapor is without parallel in these particulars—it is not only the lightest of all vapors, but also the lightest of all gases, except hydrogen and ammonia. To this circumstance the soft and tender beauty of the clouds of an atmosphere is mainly to be ascribed.

The sphericity of the cloud particles may be inferred from their deportment under the luminous beams. The light which they shed when spherical is continuous, but clouds may also be precipitated in solid flakes, and then the incessant sparkling of the cloud shows that its particles are plates, and not spheres. Some portions of the same cloud may be composed of spherical particles, others of flakes, the difference being at once manifested through the calmness of one portion of the cloud and the uneasiness of the other.

For the Scientific American.

STATISTICS OF THE PRODUCTION OF IRON.

BY PROF. PETER TUNNER.

In order to illustrate the importance of iron among other metals and non-metallic products of mines, it is necessary to condense the yearly statistics of the total mining production of the world. Statistics of this kind have been given by several writers, but none of them can be said to be strictly unobjectionable. It is even difficult to obtain the ever-changing figures from those states in which statistical records on mining are kept and collected regularly, and with the utmost care; and from countries where statistics are neglected, only approximative figures can be secured.

During the last thirty years, I have myself taken a lively interest in these figures. As a member of the jury of the metallurgical department of all the international exhibitions, I was favored with the best opportunities for obtaining the most accurate information upon the subject that could be secured. I now publish the following synoptical table, the figures of which are chiefly transcribed from records of the years 1861–5 as a result of my researches and observations:

MINING PRODUCE OF THE WORLD IN APPROXIMATE FIGURES, EXPRESSED IN GERMAN CWTS.

COUNTRIES.	Coal, cwt.	Iron, cwt.	Gold in mint pounds.	Silver in mint pounds.	Copper, cwt.	Lead, cwt.	Zinc, cwt.	Salt, cwt.
Great Britain	1,850,000,000	95,000,000	100	46,000	270,000	1,825,000	50,000	20,000,000
Austria	90,000,000	6,200,000	3,460	82,000	580,000	1,300,000	25,000	6,500,000
Prussia	420,000,000	14,500,000	5	46,000	53,000	45,300	1,250,000	4,000,000
Rest of Germany	40,000,000	5,000,000	50	71,000	4,000	24,000	—	3,300,000
France	220,000,000	27,500,000	320	25,000	85,000	45,000	10,000	7,000,000
Belgium	200,000,000	6,200,000	—	—	31,000	44,000	600,000	—
Russia and Poland	7,000,000	5,500,000	42,000	311,500	100,000	21,000	45,000	14,000,000
Sweden and Norway	300,000	3,000,000	8	45,000	45,000	11,000	—	—
Italy and Switzerland	5,000,000	900,000	320	2,200	6,200	11,000	—	4,300,000
Spain and Portugal	12,000,000	3,700,000	100	104,000	54,000	1,500,000	40,000	9,200,000
Turkey	600,000	200,000	1,600	—	12,000	—	—	1,000,000
America	330,000,000	22,000,000	192,000	2,400,000	400,000	300,000	100,000	(?)
Australia and other States	8,300,000	1,700,000	220,000	10,300	79,500	(?)	(?)	(?)
	3,214,000,000	191,300,000	459,883	2,963,000	1,591,000	4,929,300	2,350,000	90,000,000

These figures by themselves do not prove the relative importance of iron. In order to form a right idea of its real value, they must be converted into figures, comparable among each other by means of reduction to a mathematical standard, which can be easily understood all over the world, that is, with the money value of the produce mentioned in the table above. With respect to the precious metals, the average value is nearly equal in all countries; there is, however, a vast difference of prices for the common metals, the salt and mineral fuels in the various countries. The price of the German cwt. of anthracite and lignite averages in the various countries from 5 to 50 kreuzers, silver Austrian currency (the 'tun' from 50 cents to $5 gold). In order to determine the average price of coal, the price of the English coal may be considered as decisive as representing more than half the aggregate production.

In view of this fact, 20 kreuzers per cwt., or two dollars gold per ton can be assumed as the average price of coal.

The figures for the iron nearly all refer to the weight of pig and cast iron; but the work for the smelter and metallurgist does not end here; the pig iron is transformed into wrought iron and steel, and for this reason the value of the cast and bar iron, and the various kinds of steel, must be taken into consideration. The more developed the industry of a country is, the greater will be the demand for iron in general, and more particularly for cast iron. Most frequently the demand of cast iron varies between one-fifth and one-third of the whole iron consumption, and the cost of cast iron ware can be rated at the average price of five florins (one ton at $50 gold). The price of bar iron varies between three and fifteen florins, but the real average can, at most, be rated at five florins, the price of the common English kinds being decisive in fixing the standard.

The manufacture of steel has increased considerably during the last few years; formerly it was one-fifteenth, now it has probably reached to one-tenth of the bar iron production. The cwt. of steel varies from six to thirty florins per cwt. (or from $60 to $300 per tun), but the average may be fixed at ten florins ($100) per tun. In view of this great variation of the kinds of iron and the consequent variation in the prices of the same, and considering the loss in the weight which is consequent upon the transformation of the pig iron to cast-iron ware, and of bar iron into steel, the price of four and a half florins per cwt. ($45 per ton) appears to be a fair average for this metal.

Attention may be called to the fact that the anthracite and lignite, used in the smelting of iron and steel, have to be deducted from the whole production of coal, but the deduction will be, instead of five cwts. of coal for every one hundred pounds of iron (which is the actual amount of coal required for the smelting), on account of the partial use of vegetable fuel, only three to four cwts. for every one cwt. of iron.

The pound of gold (German mint pound) commands the price of 675 florins; the pound of silver (German mint pound) 45 florins.

Copper, at the mines, costs 50 to 60 florins (average 57), because the better brands predominate.

Lead varies between 10 to 15 florins per cwt., average 13 florins.

Zinc varies between 5 to 7 thalers; average 6 thalers, or 9 florins per cwt.

Among the other metals, which are not quoted in the above table on account of their minor significance, the mercury may be considered as the most important; then tin, platinum, antimony, nickel, etc. Their yearly production may scarcely exceed in value the sum of thirty million florins, or one hundred and fifty million dollars gold.

The Value of Brains.

Working as an ordinary hand in a Philadelphia shipyard, until within a few years, was a man named John L. Knowlton. His peculiarity was that, while others of his class were at the ale houses, or indulging in jollification, he was incessantly engaged in studying upon mechanical combinations. One of his companions secured a poodle dog, and spent six months in teaching the quadruped to execute a jig upon his hind legs. Knowlton spent the same period in discovering some method by which he could saw out ship timber in a beveled form.

The first man taught his dog to dance—Knowlton, in the same time discovered a mechanical combination that enabled him to do in two hours the work that would occupy a dozen men, by slow and laborious process, an entire day. That saw is now in use in all the shipyards of the country. It cuts a beam to a curved shape as quickly as an ordinary saw-mill saw rips up a straight plank.

Knowlton continued his experiments. He took no part in parades or target shootings, and in a short time afterwards he secured a patent for a machine that turns any material whatever into a perfectly spherical form. He sold a portion of his patent for a sum that is equivalent to a fortune. The machine was used cleaning off cannon balls for the Government.

When the ball comes from the mold the surface is incrusted, and the ordinary process of smoothing it was slow and wearisome. This machine almost in an instant, and with mathematical accuracy, peels it to the surface of the metal, at the same time smoothing out any deviations from the perfect spheroidal form.

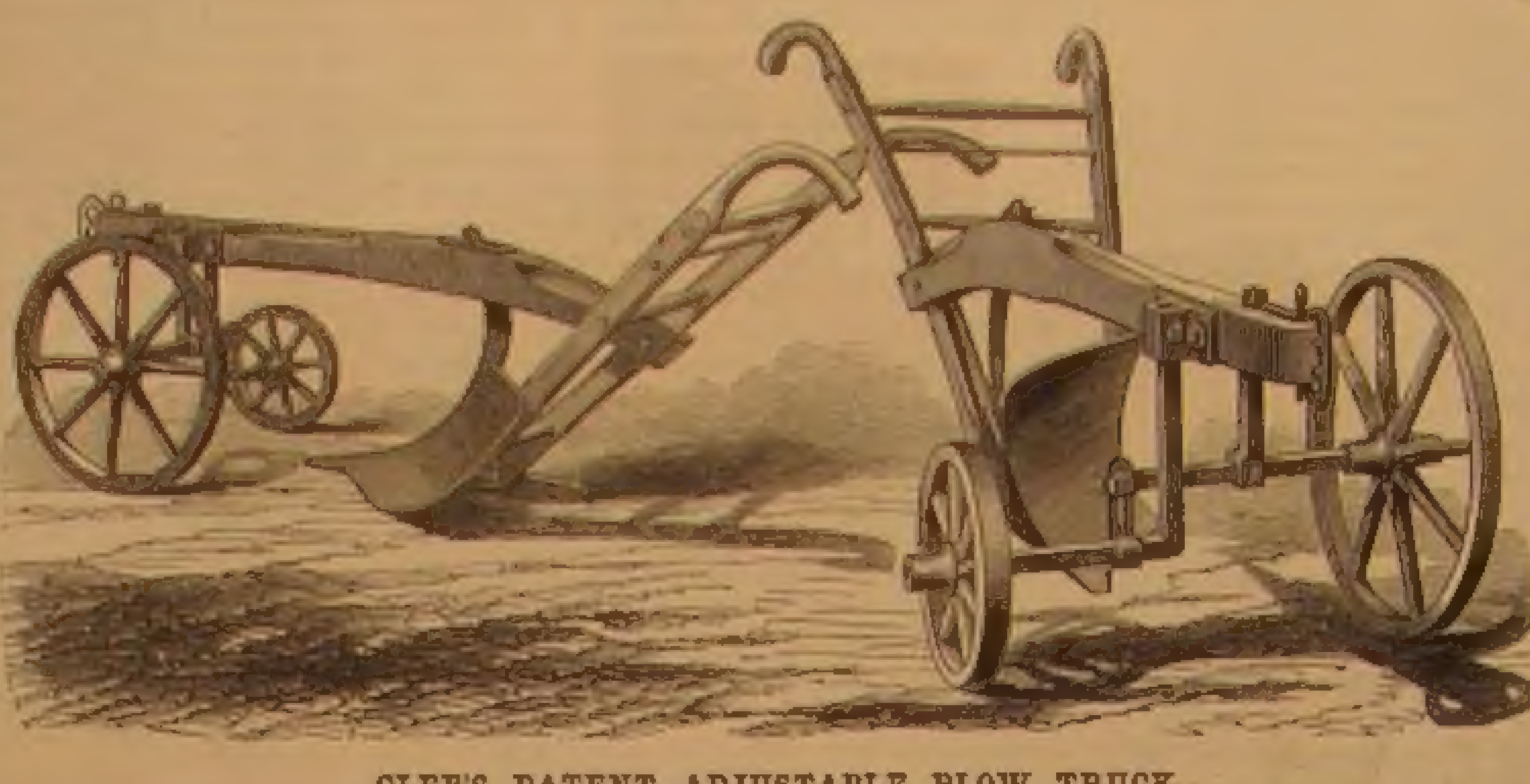
The same unassuming man has invented a boring machine, that was tested in the presence of a number of scientific gentlemen. It bored at the rate of twenty-two inches an hour, through a block of granite, with a pressure of but three hundred pounds upon the drill. A gentleman present offered him ten thousand dollars upon the spot for a part interest in the invention, in Europe, and the offer was then accepted.

The moral of all this is that people who keep on studying are sure to achieve something. Mr. Knowlton doesn't consider himself by any means brilliant, but if once inspired with an idea, he pursues it until he forces it into tangible shape. If everybody would follow copy, the world would be less filled with idlers, and the streets with grumblers and malcontents.

THE FRENCH ATLANTIC CABLE.—The manufacture of the French Atlantic cable is rapidly approaching completion. Up to the 14th of April the total length manufactured was 3,084 nautical miles—about 2,214 miles of the section intended to be laid between Brest and St Pierre, and 716 miles of the section between St. Pierre and the United States. Only 474 miles of the former section and 37 of the latter remain to be completed. The whole length of the core for both sections was finished April 15th, at the Gutta Percha Works. The *Great Eastern* has taken on board 1,750 miles of the first section, and the steamer *Scandaria* 450 miles of the second section.

Improved Self-Holding Adjustable Plow.

The object of this device, as stated by the inventor, is to provide a simple and convenient arrangement for adjusting plows to the varying width and depth of the furrows, as may be required. Two views are shown in the accompanying illustrations,one exhibiting one side,and the other the opposite side of the plow with the track attachment. The plow itself is an ordinary plow, such as is generally used,the attachment being capable of application as well to plows now in use as to those which may be built to receive the device. This itself is very simple: it being only two wheels of different diameters, on independent axles, the larger one to run in the furrow already made, and the smaller one to run on the untouched surface. By this contrivance any required depth and any required width of furrow may be assured, and the share made to take and sustain any angle.



CLEE'S PATENT ADJUSTABLE PLOW TRUCK.

On the plow beam, in front of the share, are bolted two plate sockets, one on each side, the holes in the sockets being square and vertical. In one, the shank of the bent axle of the small wheel fits, and is secured to any position by a set screw in the sleeve or socket. The other receives a bar similarly secured, the lower end of which embraces the straight axle o. the large wheel. At the end of this axle is a slotted arm the lower end of which embraces the horizontal portion of the small-wheel axle, while a bolt passing through the slotted arm and the end of the large-wheel axle, serves to hold both axles in position. By these arrangements either wheel is made capable of vertical adjustment, and the large wheel may be also adjusted horizontally to govern the width between the furrows. The relative positions of the two wheels may be changed to adapt them to a right hand or left-hand plow. Both the uprights are provided with marked scales for adjusting the depth of the furrow.

According to the inventor, a plow with this device is self-holding, the driver needing only to attend to his team; any one who can drive a team can plow better than the best plowman with the ordinary plow, without the truck; an equal furrow in depth, width, and direction; the plowshare being self-sharpening as its point is kept always level; the draft lighter, and thus the labor less on the team—the truck bearing the load usually borne by the horses; the weeds being turned under and held by the large wheel and axle until covered, and other minor advantages evident to the practical reader without special notice.

Patented through the Scientific American Patent Agency March 2d, 1869. State and manufacturing rights for sale by the inventor, Joseph Clees, or J. N. Clees, Nashville, Tenn.

Solid Emery Grinding and Polishing Wheels.

Solid emery wheels have lately come into very general use for grinding and polishing. When well made they wear evenly and cut rapidly, and as they require no redressing, but last until entirely worn out, they are rapidly superseding the old-fashioned wooden wheel coated with emery, and even usurping some of the functions of the ordinary grindstone.

The engraving presents a perspective view of a machine for carrying one or two of these wheels, fixed on the same shaft and driven by the same belt. A stand supports two bearings with their boxes, in which runs a shaft carrying, in the space between the boxes, a pulley, and on its ends solid emery wheels. A slotted projection at the base of either bearing receives an ordinary rest, such as is used on a lathe for hand turning, that is held in position by a nut and bolt. The machine is bolted to a bench at any convenient point.

IMPROVED EMERY WHEEL GRINDING MACHINE.

The machine can be used for grinding tools of every description, is a great saver of files in reducing and polishing surfaces, and does the work in either case much more rapidly than can be done on the grindstone. Parties having them in use commend them in the highest terms. The wheels used are those manufactured by the Tanite Company, Stroudsburgh, Pa. For further information, address American Twist Drill Company, Woonsocket, R. I.

Cleaning the Exterior of Buildings.

This question, says the *Mechanics' Magazine*, has been recently taken into reconsideration by our Gallic neighbors, and toward the end of last year, an order was issued by the Prefect that the façades of all dwellings in the 3rd, 4th, 9th, and 10th divisions (arrondissements) of Paris should be periodically cleaned, the law to take effect on and after May 1, of the present year. So far back as 1852 there was a law promulgated to the same intent, but its injunctions have been so frequently neglected that the authorities have thought it requisite to call prominent attention to it by issuing what might be termed a new edition. The old act ran as follows: "The façades of houses are to be kept in good repair. They are to be rubbed, plastered, painted, or the surface either renewed by cleansing in some manner or another, at least once in every ten years, at the expense of the proprietor. A noncompliance with this regulation will subject the offending party to a fine not exceeding £5. Although the legislation thus insisted on the general principle, the particular *modus operandi*, or means of putting the principle into execution, was left altogether to the discretion of the owner. The favorite method which has been successfully practiced for the last two years, is that of cleaning the walls by the employment of a jet of water projected under steam pressure. There are many advantages attached to this plan of proceeding. It not only restores the façades to their original appearance, but it does not injure the more delicate, decorative, and ornamental portions of the building, neither does it destroy the then protecting coat which the stone has received from the influence of the atmosphere. By this method we insure the fulfillment of several valuable conditions. First, cheapness; second, the preservation of the more fragile and sculptural work upon the edifice; and, third, universality of application. If, in addition to the enforcement of some regulation of this description, with respect to the buildings in our principal streets and thoroughfares, those in our narrow courts and alleys were brought under the same jurisdiction, the result, in a sanitary point of view, might not be inconsiderable. It has been calculated that were the exterior of the buildings in London kept in a clean fresh condition, instead of being nearly black from top to bottom, there would be a gain of nearly half an hour's daylight in every twenty-four hours.

Collecting and Utilizing Sewage.

The two main points in the sewage question are, the effectual removal of refuse and fæcal matter from our dwellings, and its efficient utilization upon our lands. Upon these points there exists a great variety of opinions, some advocating one method of removal and utilization, and some another. Into the various methods proposed, suggested, or in use, we need not here enter; they are sufficiently well known to all who know anything at all about the matter. We point to our Metropolitan main drainage as a sufficient answer to the first point in question, and to the Croydon irrigation works as an equally sufficient answer to the second. But it may be said that our cities and towns are not Loudons or Croydons, and that many clusters of habitations are neither cities nor towns. Then naturally follows the question of how to deal with a limited amount of sewage? Of course, everybody will say, there are many ways of doing that. We admit there are, and we will now point out one of them, the most recent that has come under our notice. This is the system of M. Delbriel, which was explained to a meeting of gentlemen practically interested in the sewage question on the evening of 7th April. The meeting was held at the Inns of Court Hotel, Holborn, the Duke of Castelluccio in the chair. M. Delbriel's system of collecting and utilizing sewage is better known in France, where it is practically applied in several places as *vidange à vapeur*. It consists in using a traction engine,to which are attached tanks, into which the sewage is pumped by the engine. During the extraction of the sewage, the mouth of the cesspool is covered with sailcloth steeped in sulphate of zinc. The mephitic vapors are drawn off from the tanks by means of pipes which communicate with the engine furnace in which they are burned. By these means, it is affirmed that no unpleasant smell or noxious vapor ever finds its way to the air, while the sewage in the highest condition for fertilizing purposes does find its way on to the lands of the farmers. Depôts are established where the sewage is deposited, and from which it is distributed to the farmers. Or otherwise it is supplied on to their lands direct from the tanks. In all this there sounds to our ears—who have been accustomed to a widely different dealing with the same question—a return to the old cesspool system, the engine doing duty for the horse and men of the old night cart. But it must be borne in mind that with all our sanitary progress there are yet many spots in Great Britain where the system would be a great boon, and to these M. Delbriel proposes its application. That it has proved a great success in France is due to the very different sanitary and agricultural conditions of that empire as compared with the United Kingdom. On the whole, M. Delbriel's system is well worthy of consideration, and, therefore, we subscribe to the following resolution, which was passed at the meeting in question; "Considering the present great waste of the sewage of towns, etc., and the necessity of diverting it from rivers and streams, and the value of applying it to the purposes of agriculture, this meeting is of opinion that M. Delbriel's system is worthy the attention of the public, and more especially all persons interested in this important question, and that it is desirable that M. Delbriel should issue a translation of his pamphlet."—*Mechanics' Magazine.*

The Auroral Currents.

We are asked if the currents produced on the wires during these displays are atmospheric, acting direct from these auroral phenomena, thus irradiating the heavens, and which weave their triumphal coronas up apparently among the planets? Although there are, unquestionably, large masses of electric clouds sailing in the upper regions of the air during the presence of these auroral displays, yet the fact that all, or nearly all, interference from the currents then exhibited can be prevented by simply using two wires instead of the earth and wire, proves that these currents are caused by a disturbance of of the earth's normal electric state. The earth's ordinary electric tension is disturbed, and its currents are, so to speak, scattered by this induced current from the vast masses of electricity in the sky, but are ever seeking, by the violent action peculiar to them, to restore themselves to their normal condition, thus causing temporary electric currents of great power and rapid changes of tension. Thus they enter a wire from one earth connection in this effort at restoration, and are chased back by another from the opposite extreme, exhibiting the violent and changeful currents which mark these magnetic storms. The earth, itself, is a great reservoir of electricity, offering no sensible resistance to the entrance of electrical currents, yet varying in its electric tension or condition at different points. This causes an almost ceaseless action of the earth's currents, and at almost all times they can be felt upon the wires which they use to effect the equalization of their tension. During the auroral displays this action is excessive. At the same time it can scarcely be regarded as incorrect to say that it is the induction of vast volumes of electricity from the upper air which causes these extraordinary currents which, as we have seen, can be utilized and harnessed for human service; and as a line can be worked by any polarity, provided the whole wire is worked with a like polarity, the changing currents do not prevent the line from being operated during the violent contest for the supremacy of the one current or the other.—*Journal of the Telegraph.*

MATTER and motion constitute the visible universe.

Improved Low-Water Steam Port.

Ever since the invention of the steam engine, the attention of scientific men has been directed to the discovery of means to guard against the danger of low water in boilers.

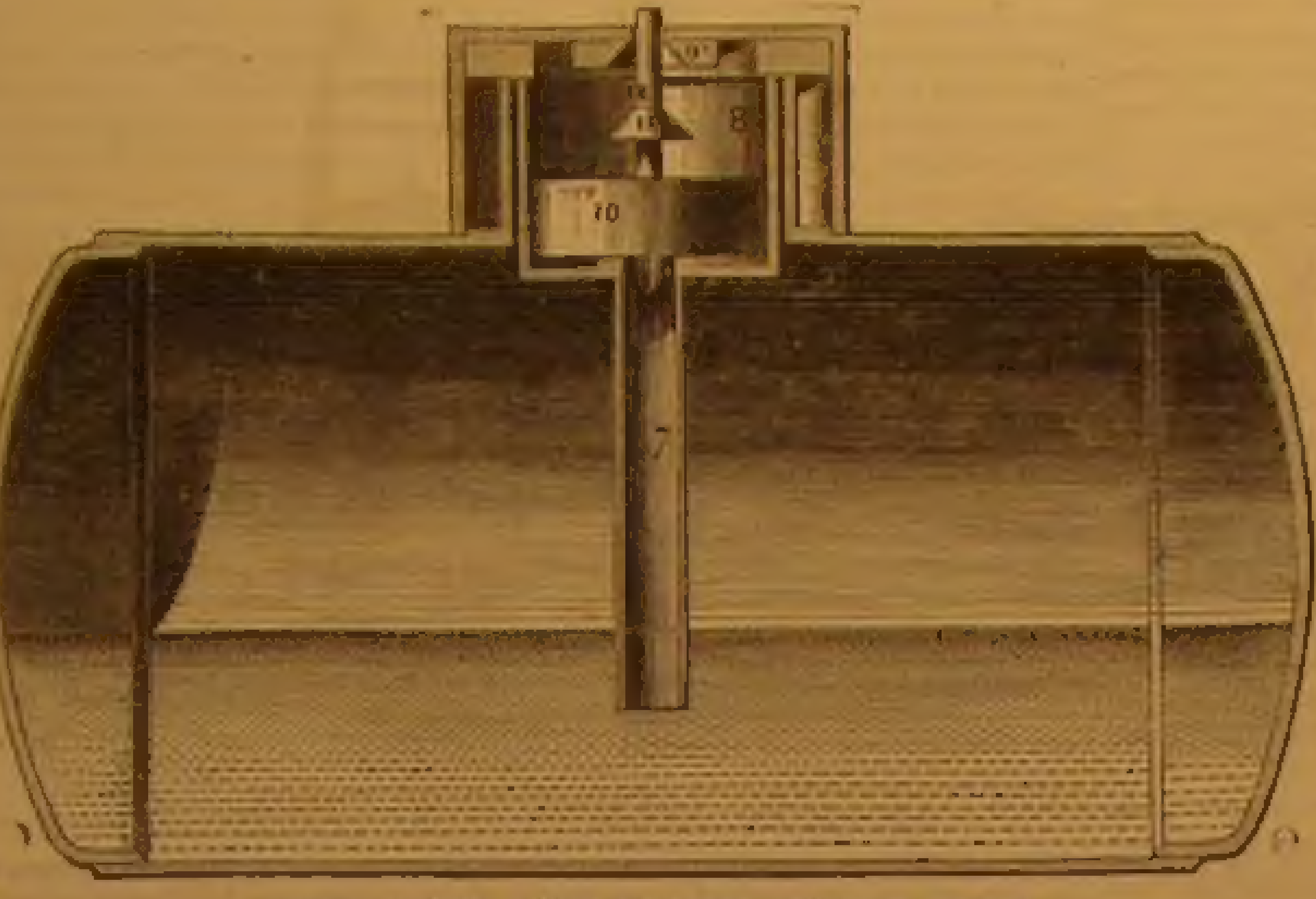
In consequence of the liability of supply pumps to become foul or defective, this danger is always imminent. A great number of devices have been tried, but nothing heretofore discovered was so eminently practical as to become a necessary appendage of the steam engine and an essential of every first-class boiler.

The void so long existing is now claimed to be filled by Cochrane's low-water steam port, constructed in accordance with principles of natural philosophy, well understood, and therefore always uniform in action.

A valve is made, composed of a spindle and piston united (10, 12). The latter is hollow, so as to make the specific gravity about the same as that of water. A chamber is constructed (8) in which the piston moves freely. The valve seat (9) in the head of this chamber is closed, as the valve rises, by a bulb (11) on the spindle. A tube (7) extends from the bottom of the chamber to low-water mark in the boiler. When there is a sufficiency of water, the steam forces it up the tube and fills the chamber. This sustains the piston and the pressure of steam upon the spindle and closes the valve. On the other hand, when the water is below the opening of the tube, the chamber is filled with steam instead of water, and the weight of the piston causes the valve to descend and open, allowing the steam to escape.

The action of this simple steam port is just as certain as the laws of nature on which it rests. It always gives timely notice of low water, and continues the warning till the boiler is supplied. The engineer will be greatly relieved, as it performs perfectly and constantly one of his most important and onerous duties. It does not merely act at the point of danger, but gives information in time for pumping to begin. Hence the boiler may always be worked with safety at the minimum of water, and with corresponding economy of fuel. Should this invention be the means of guarding against all danger from low water, its general use will mark an era in the history of the steam engine.

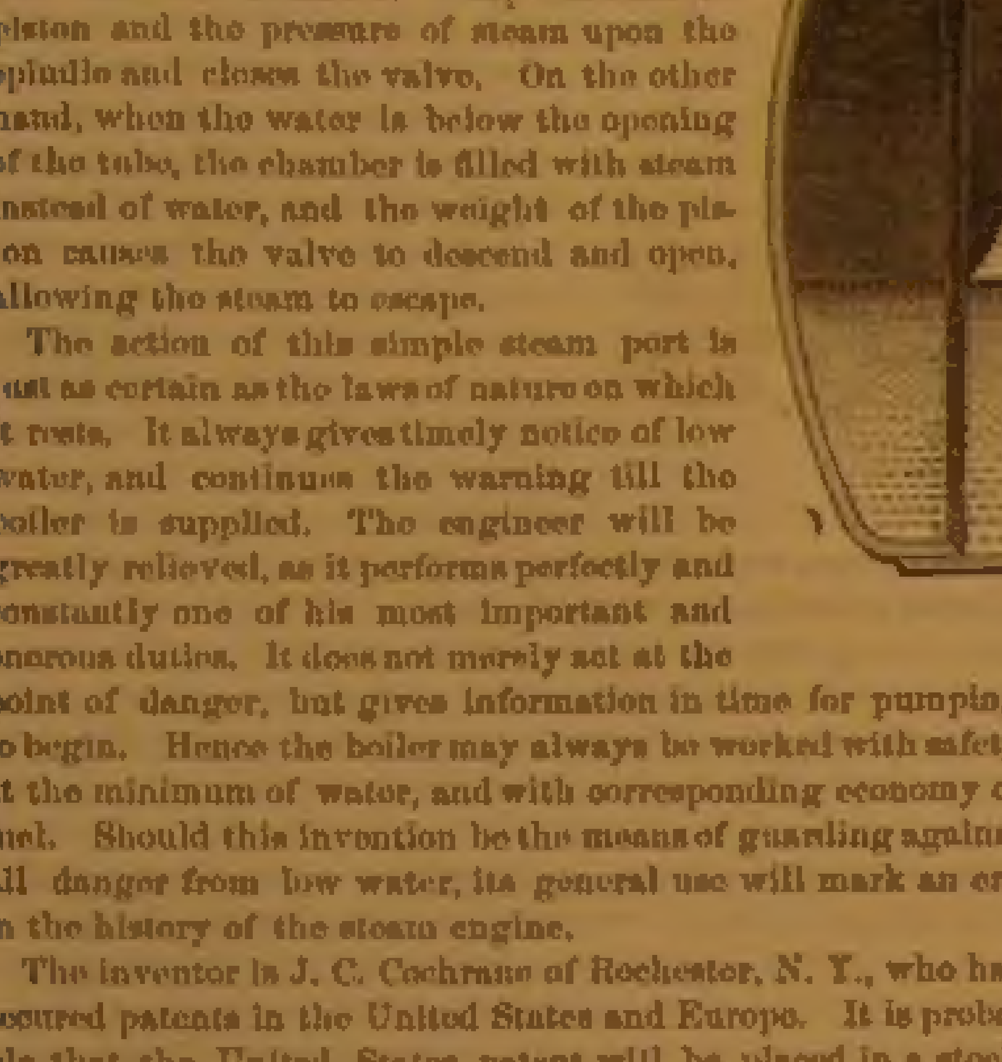
The inventor is J. C. Cochrane of Rochester, N. Y., who has secured patents in the United States and Europe. It is probable that the United States patent will be placed in a stock manufacturing company, either in New York or Boston, unless superior advantages are presented elsewhere.



COCHRANE'S LOW-WATER STEAM PORT.

HARRIS' IMPROVED PATENT SHUTTER AND BLIND OPENER AND FASTENER.

Opening and closing blinds and shutters from the inside of the house have formed the subject of a number of patents, some of which are of great merit, but few of them present equal claims to efficiency with that shown in the accompanying engravings, it having no springs or other adventitious aids to its proper operation.



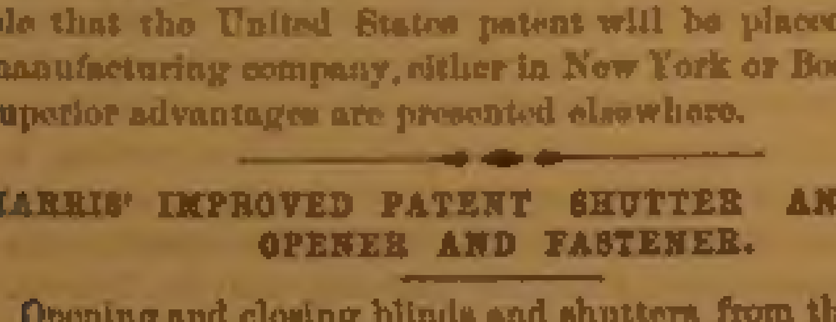


Fig. 1 shows one leaf of a shutter on which is secured a plate, A, shown in exaggerated proportions to exhibit the device plainly. On this plate is a catch, B, seen more plainly in Fig. 3, for receiving the bar, C, Figs. 1 and 2. This bar passes through a sleeve plate, D, secured to the stile or casing of the window frame, and is jointed, as seen in both figures—1 and 2. The bar or rod for ordinary blinds need not be more than three-eighths of an inch in diameter. A hinged loop or guide, E, guides the bar in opening and closing the blind. When the bar is turned partly around in its boss, D, so as to bring its bent arm to an upright position, and then pulled inward the shutter will be closed because of the connecting loop, E, and then by turning the bar in the opposite direction, the bent arm will again enter the catch, B. A reverse motion opens the blind when the position of the handle of the lever will be, as seen, as at F, Fig. 1. The different notches in the catch, B, are intended to "bow" or set the blind at any angle required, and the position of the blind is assured in any position by means of a set screw in the boss, D, seen in Fig. 1. Thus the shutter, or blind, can readily be held either opened back against the building, partially closed, or securely fastened when entirely closed.

Patented April 6, 1869, by George A. and John B. Harris, who may be addressed at Deerfield, N. J.

Property in Patents.

The farmer "rises up early and eats the bread of carefulness;" he spends his time and his money in earnest efforts to increase the value of his farm, his crops, and his stock. This property the law recognizes as his, and defends him in its possession. If a man steals one of his horses the law sends the thief to the penitentiary and public sentiment says "Amen!"

The inventor likewise devotes his time and money to the invention of that which will be useful to this farmer, and will aid him in the culture of his land or in securing his crops. He invents a reaper which gathers his grain, or a thrasher which makes it ready for the mill.

While the farmer is producing his crops he is furnishing bread to his family. While the inventor is devising his machine he is bringing in no bread to his family, but is exhausting the means already on hand, and his family is often in the greatest want.

Now, which should be the most sacred in the eye of the law, the horse raised by the farmer, or the invention perfected by the brain worker? Certainly it would be morally just as nefarious to wrong the inventor, by appropriating his property in ideas to which he has given an embodiment, as to steal a horse from the farmer. And yet how few regard the subject in this light. Many who see a new and valuable thing, look at it and want one, but say, "Well, I can make one good enough for me for half the money;" or a manufacturer will say, "I can modify that a little and make one just as good, and save paying that inventor a royalty." Is that man or manufacturer honest? And yet he would be shocked, and his friends would be shocked, if you were to insinuate that he was a *thief*. There is an impression that property acquired by physical labor is sacred, but brain work does not cost anything, and its creations are of no value. What a mistake! Brain work is immensely more exhausting to the vital forces than physical labor, and the discriminations of law and public sentiment, if any difference be made, should be in its favor.

We have been led into these remarks by the proposed passage of a bill by the Ohio Legislature, enacting that when an inventor sells a patent right, and receives a note therefor, the note shall state, on its face, that it is for a patent. Now, what sense is there in this? If the purchaser does not suppose that he is getting value received he should not give the note. The idea of the wise member who introduced the bill is, that the note thus drawn would not be negotiable, and if the purchaser of the patent finds it not as valuable as he supposed he may honorably repudiate. If this procedure is right, in this case, why not apply it in commercial transactions generally? Let a man give his note for a horse, saying, in the note, that it was given for a horse, the presumption being, as in the patent case, that if the horse is found unsound, the note shall be null and void, would that note have any market value? How would trade generally be affected under such a system of note giving? It would, at once, put us strictly upon the ready pay system, which, although best in the long run, is very unhandy when a man in want has not the money to supply his need. The proposed bill is an outrage upon inventors and manufacturers, and simply implies that they are a set of scoundrels whose main object is to swindle the public.

We had also another thing in view when we began this disquisition, and that is the disposition of unprincipled manufacturers to defraud the very men whom of all others they should most befriend. Instead of welcoming the new invention and dealing fairly with the inventor by paying him a royalty for his invention, their disposition is, as before stated, to take the main idea, make a slight modification, and put out the invention as their own. The public sentiment should be so changed that such a man shall, hereafter, be regarded as a dishonest man. Public sentiment makes law, and such a man acts honorably only through fear of the law.

[We find the above truthful remarks in the *Forge Journal and Farm Machinist*, published at Cincinnati, and commend them to legislators and others who are wanting in a proper appreciation of the rights of inventors.—EDS.

Diseases of Metal Workers.

The fact that metal workers are liable to the attacks of special diseases is admitted by all medical writers. The lead colic and lead palsy of plumbers and painters, the metal ague of brass melters, the pulmonary affections of dry grinders and needle pointers, and the peculiar ails of japanners, lacquerers, gilders, enamelers, and others who are exposed to the fumes of mercury, lead, or arsenic, may be cited as some of the ills that working flesh is heir to. Dr. William Frank Smith, F.C.S., the physician to the Sheffield Infirmary, publishes his notes, in the London *Lancet*, on seven cases of a paralytic affection which he terms Hephæstic Hemiplegia, or Hammer Palsy, and which does not appear to have hitherto attracted much attention. Two table-blade strikers, a razor-blade striker, a hammersmith, an engineer, a file-forger, and a silver-plater, were the patients. With one exception, they were either young or in the primo of life; temperate, healthy, and, with the exception of the continual use of the seven-pound, single-handed hammer of their trade, exposed to none to none of the causes of paralysis. It is satisfactory to learn that this new disease can be combated by medical skill, and that in all the cases recorded by Dr. Frank Smith complete or partial recovery has followed the use of phosphorus, iron, strychnia, and cod liver oil, with absolute and prolonged abstinence from the forge.

ROWE'S MODE OF FASTENING CARDS TO CYLINDERS

There are two ways of clothing the cylinders of carding machines: one with sheets, and the other with filletings. The latter are used for "licker-ins," "deliverers," and "doffers," the other for the main cylinders. The cylinders are either of wood or iron; but in either case the material differs greatly from the leather that forms the basis of the card. This shrinks or stretches according to the temperature and length of time it has been in use, while the surface of the cylinder is not subject to these changes, or they are not equal in amount or coincident in time with those of the leather. In clothing the cylinder with sheet cards, the ordinary method is to tack the edges of the sheets to the cylinder, whether of wood or iron; in the latter case, holes being drilled in the iron and plugged with wood to receive the tacks. To strip the clothing off such a cylinder and replace them is a work requiring not only time, but skill and experience. In fact, the qualifications of a carder should be to clothe card cylinders as well as to manage the business of a carding room.

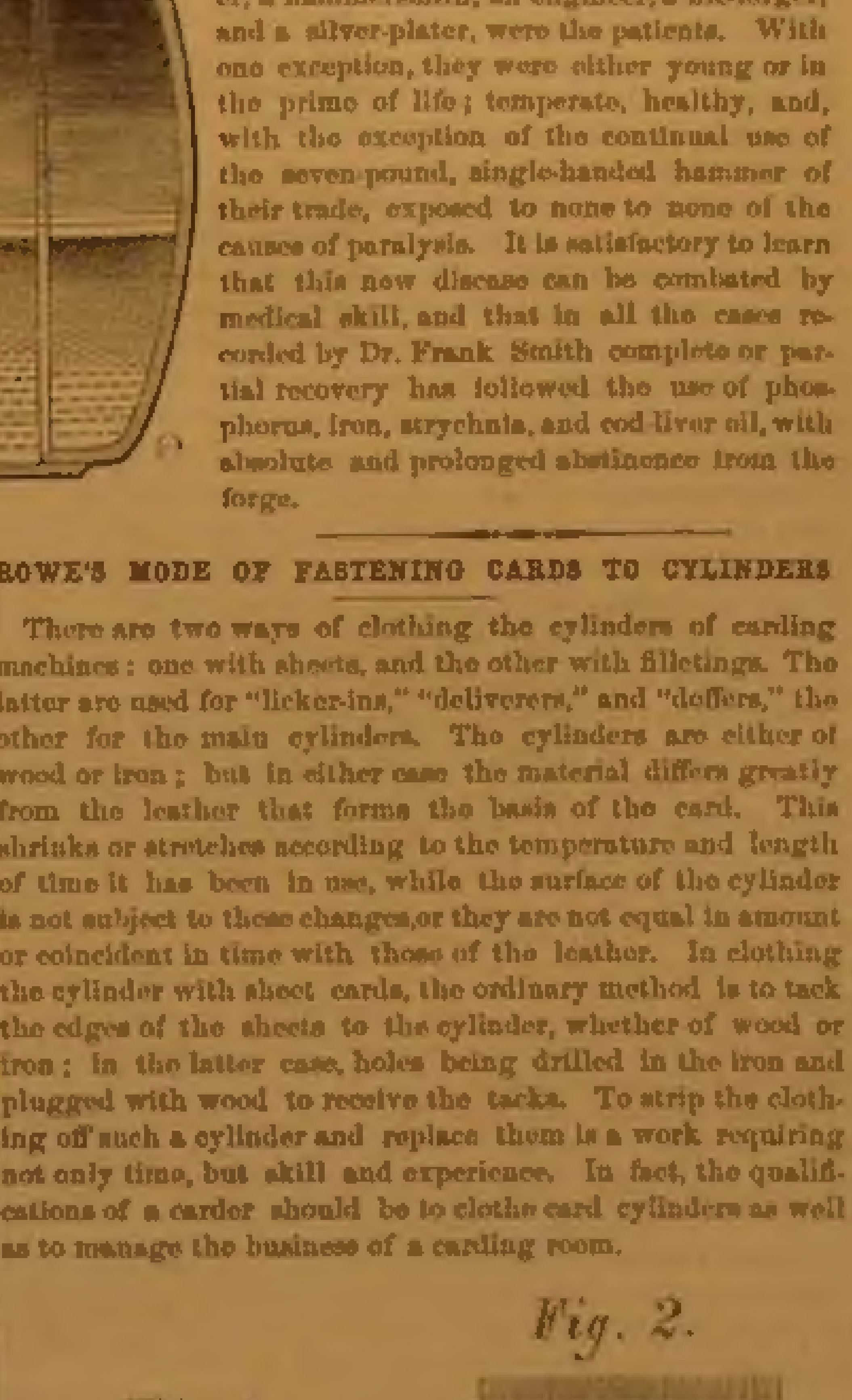


Fig. 1 of the device herewith illustrated is a vertical cross section of a portion of a cylinder, and Fig. 2 a longitudinal vertical section. The edges of the sheets are either sewed, riveted, or cemented to make a continuous band or covering. The cylinder at the requisite distance is scored with transverse grooves, about three-quarters of an inch wide, into which the edges of the card sheet are forced by means of a bar or rod, A, and a series of screw bolts and saddles, B, by which they are also held in place, and by which they can be adjusted as required. Card clothing by this means can be retained in place, and with sufficient tension to hold it until the card is entirely worn out. The advantages of this device are so apparent that any practical man cannot fail to appreciate them.

Patented Dec. 22, 1868. For further information address the assignees, Helmick, Mooney & Co., Pana, Christian county, Ill.

IT is computed that the total number of persons annually employed in getting coal in Europe is 700,000. In Great Britain, 300,000; in Belgium and France, 120,000; in Prussia, 80,000, and the remaining 200,000 elsewhere.

THE PREPARATION OF COTTON WARE FOR DYEING AND PRINTING.

[Written for the Scientific American] by DR. M. REIMANN.

SINGEING.

This is the first operation to which the cotton ware must be subjected. By it, the fine down which covers the wefts, and is of great inconvenience, especially for printing, will be removed from the ware. The old method consisted in turning the ware quite equally by means of rollers upon a cast-iron half cylinder or on half-cylindrical plates, which are heated from below, and are therefore red hot.

The goods are generally singed twice; at first upon the side which is to be printed, and then upon the other. Much better than the process of singeing with red-hot cylinders is that of employing for the same operation an intense flame. An alcohol flame is too expensive; the flame produced by oil attacks and injures the weft far too seriously to make it practicable. The most suitable flame is that of gas. The gas must be employed to proceed from an iron tube which has a series of small apertures beside each other, so that we obtain a flame of some length when the gas is ignited. Above this tube a horizontal tube is supported, which is, in construction, similar to a channel, and has an opening fronting the previously-mentioned tube. This channel is combined with other vertical tubes, and causes a strong draft of air, by which not only the products of combustion are removed, but the flame is also caused to pass over the meshes of the weft, and thus to consume all the down on the upper side of the weft. Hence, when gas is employed, the operation of singeing must be performed but once.

If the gas were to proceed directly out of the openings of the horizontal pipe, we would obtain the desired continuous flame, but it would ignite and render the weft black by its soot. To prevent this, there is inserted above every small opening from which the gas proceeds, a wide metal tube in a vertical position, so that it forms a right angle with the horizontal tube above. These wide tubes that are placed over every opening, have at their base two openings on each side. When the gas now proceeds out of the previously-mentioned small apertures, and a light is held over the upper end of the wide tube, so much air is drawn into the tube and mixed with the gas by means of the openings on the sides of the wide metallic tube, that the flame produced will not ignite fully, but burn with a weak blue light, which is free from all superfluous carbon, and will therefore not soot the weft. This sort of burner is generally known as the "Bunsen burner," and is the invention of the celebrated chemist of that name These Bunsen burners are generally employed in laboratories; at present they are, however, used also for domestic purposes whenever anything is to be heated without being covered with soot. The entire horizontal tube is then covered with these burners, placed alongside of each other. Then, when the gas is turned on in the burners, and a light applied, a long blue flame is produced, which, though it is devoid of full brightness, and not perfectly ignited, gives a very intense heat. Moreover, while the results attained by these burners are far more favorable than without them, the gas consumption is also less when they are employed. Until quite recently the goods were drawn over the top of the gas flames. The top of the flame being, however, everywhere a little higher where there was a burner below, the weft that was drawn across was necessarily singed irregularly, that is to say, either it was singed imperfectly at some spots or burnt at others.

A French manufacturer of machines, Mr. Tulpin, of Rouen, has lately introduced another mode of drawing the goods through the flame. He does not draw the goods over the top of the flames, but places on each side of the flame a metal roller, whose surface is touched by the flame. Over these two rollers he draws the weft, which no longer meets the top of the flame, but the sides. These sides of the flame can very readily be obtained of perfectly regular dimensions, and thus the goods are singed quite well and without any fault; they can, of course, be singed twice by one flame, if they are drawn the second time over the roller on the other side. By a simple construction it may be caused to touch the flame with its upper side the first time, and afterward with its lower side.

After being singed, the goods are subjected to the second preparatory operation, namely, bleaching.

This process must be divided into two parts. The manipulations in the first part have the purpose of removing from the weft the resinous substances, gum, and fat, contained in it by nature, as also those substances which were added in the process of manufacturing. The operation of the second series embrace the bleaching, *par excellence*, by these operations, both the coloring matter, contained by nature in the fiber, and that which was added to it in the processes of spinning and weaving are removed.

THE NEWEST BLEACHING PROCESS EMPLOYED IN MOST MANUFACTORIES.

It is necessary here to remark that the weights, as they occur below, are calculated with reference to a quantity of 60 yards of cotton ware.

(1.) The ware is at first boiled for five hours in the steam apparatus, whose description will be given further on, with lime milk. The tension of the steam must amount to at least 3—3¼ atmospheres. The lime milk may be produced by combining with 80 lbs. of lime as much water as is necessary. The ware, after being boiled in the lime liquid, is cooled in the same apparatus with cold water, and then washed.

(2.) The goods are now placed from 7 to 10 hours in a bath of hydrochloric acid, 2¼° strong, according to Baumé's areometer. After being sufficiently treated with the hydrochloric acid, the goods pass through the washing machine, and are (3.) boiled with resin soap in the same steam apparatus.

The resin soap necessary for this purpose is obtained by boiling 120 pounds of colophonium with a solution of 200 pounds of soda-ash. When the goods are thoroughly boiled, the liquid is allowed to pass off, and the cotton is treated (4.) again with resin soap. This time the boiling operation must be continued for 4 hours; the same quantity of resin soap must be employed as in the first boiling operation. The same liquid may be used on the next occasion for the first boiling of the cotton. After this second boiling of the cotton ware with resin soap, the goods are either immediately washed or boiled for some hours in a solution of 200 lbs. of soda crystals. They are then washed and passed into the bleaching fluid. It is especially advantageous to perform this operation of boiling with soda crystals, when the water contains considerable quantities of lime, and hence a precipitation of lime soap might result.

(5.) The bleaching fluid with which the ware is now treated, is a solution of bleaching powder (hypochlorite of lime), with a specific weight of 1,025, the specific weight of the water employed being 1,000. In this liquid the goods remain from 7 to 10 hours.

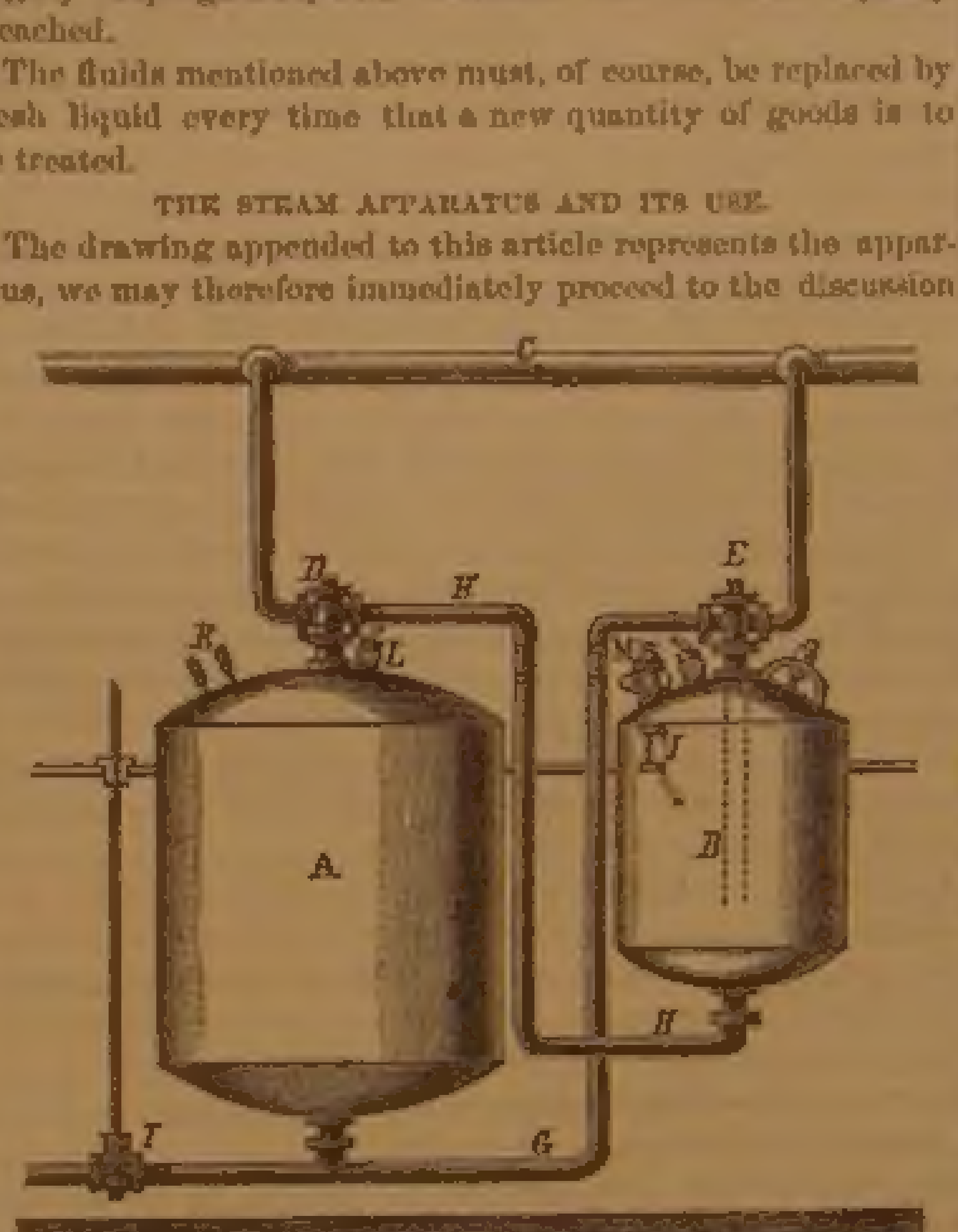
(6.) They are then washed and brought into a bath of hydrochloric acid. After remaining here for a similar length of time, as in the preceding case, and being washed, they are dried, either by suspending them in some apartment, or by means of a steam-drying cylinder.

In the operations designated above by the numbers 2, 5, and 6, the liquid with which the goods are treated from 7 to 10 hours is allowed to pass off some 3 to 4 times into a wooden vat below, and then again poured, by means of a pump, upon the goods. By this circulation of the fluid, the important advantage is gained that the cotton becomes more thoroughly impregnated, and therefore will be more equally bleached.

The fluids mentioned above must, of course, be replaced by fresh liquid every time that a new quantity of goods is to be treated.

THE STEAM APPARATUS AND ITS USE.

The drawing appended to this article represents the apparatus, we may therefore immediately proceed to the discussion



of its use. The bottom of the large boiler is covered with stones, and then the entire boiler is filled with the goods, in such a manner, moreover, that no empty space remains between the folds of the weft. The more the pieces of goods are pressed against the sides of the boiler, the better and more equally the boiling will proceed. When the boiler is filled, some layers of ordinary linen cloth are placed on the top of the cotton ware, and are in turn pressed by the addition of some stones. Then the manhole, K (see the drawing), is closed, the cock, I, opened, and steam allowed to enter through the cock, D. As the steam enters, it presses down the pieces and removes the fluid adhering to the ware, as also the atmospheric air. When the steam begins to rush out of the cock, I, this cock is allowed to remain for some minutes open; in this time the lime milk or the resin-soap solution is introduced through the cock, M, into the boiling vessel, B; these liquids are heated by steam, which enters through the cock, E. The cock, D, is then closed, so that the boiler, A, is in no combination, either with the steam tube, C, nor with the tube, H. After some minutes, when the tension of the steam in the boiler, A, is reduced by cooling, the cock, I, is closed, and the cock, D, opened, so that this boiler, A, is brought into connection with the tube, H. Then the pressure of the steam in the boiler, B, drives the fluid from the boiler through the tube, H, over the goods contained in the boiler, A. When the entire fluid has been driven from B into the boiler, A,—which may be observed by the glass tube, J,—the cock, E, is closed, so that the boiler is in combination neither with the steam tube, C, nor with the steam tube, G. Steam is now allowed to enter the boiler, A, and after some minutes, during which time the pressure of the steam in the boiler, A, rises, the cock, E, is opened. As the drawing shows, this cock connects the boiler, B, with the tube, G. In this manner the steam drives the fluid through the goods and through the tube, G, back into the boiler, B. It is necessary that during this process the air-cock, L, of the boiler into which the fluid is driven, be opened. At the same time equal caution must be observed in closing it in proper time, as otherwise the entire fluid might escape by means of it. When the entire fluid is again in the boiler, B, which may be observed by the glass tube, J, the steam is shut off and again passed into the boiler, B, to heat the fluid contained in it, and to drive it a second time into the boiler, A.

The operation described above is repeated for a period of four hours, which time suffices for a thorough treatment of the goods. Finally, the outlet-cock, I, is opened, and when the steam has driven the fluid out of the boiler, A, it is allowed to rush through the boiler for some minutes more, and then shut off, after which the air-cock, L, is opened. As soon as the steam in the vessel, A, has lost its pressure, the manhole is opened, and the goods cooled with cold water. In filling the boiler, B, a little space must be left, in order that the fluid may expand.

The proper dimension of the space to be left free is readily determined by the glass tube, J.

SHEARING THE WARE.

The shearing operation has as its purpose the removal of that portion of *down*, which is fixed by weaver's glue, and therefore not destroyed by singeing; it rises again after the removal of the glue by the bleaching. The shearing machine, which is most frequently employed, is that with the vacillating cylinder. The shearing apparatus consists of a knife, from 3 to 4 feet long, and a wooden cylinder parallel to it, in which are set steel rails, formed like coils. The cylinder receives a rotating motion, backward and forward, by a simple mechanism. The knife raises the down, while the knives, set in the wooden cylinder, cuts it off. For removing the down which has been sheared, a brushing apparatus is employed. The ware is wound up after this operation, and is now ready for printing.

FINISHING, LAYING, AND PRESSING THE COTTON WARE.

The majority of cotton ware, whether it be white, dyed, or printed, must, before being ready for trade, receive a certain degree of stiffness and smoothness—that is to say, it must be finished. Finishing is effected with a more or less solid starch paste. In some cases this paste must be transformed by the addition of a little bleaching powder in solution into *Leiocome*.

If the goods are to be bright, it is necessary to add to the starch paste some wax, stearine or spermaceti. As cotton always receives through the bleaching process a certain yellow shade, it is passed through water in which some ultramarine is in suspension, and then finished. It is also possible to add for the same purpose a quantity of ultramarine to the starch paste with which the finishing is effected. The pieces, after being starched, are calendered to impart to them a certain degree of smoothness. Previously, however, the pieces must be moistened.

This moistening of the ware is effected by entering it into a sprinkling machine. This consists of a cylindrical brush, the hairs of which dip into a vat below the brush, which is filled with water. The brush, when brought into rotation, rapidly throws a rain of small drops over the ware. The pieces are then allowed to lie quietly for some time, so that the moisture may extend over the whole surface of the ware. This moistening operation can be entirely dispensed with if in the course of the finishing operation there be added to the mass some hygroscopic salt, that is, one that attracts moisture from the atmosphere. If, for instance, the mass is allowed to contain a small quantity of hydrochlorate of lime, and is allowed to lie quietly for some hours in a cool room, so much moisture is attracted as to render the sprinkling unnecessary.

A finishing mass, which can altogether dispense with the sprinkling, may be composed as follows: In 25 gallons of the starch paste are dissolved 100 grammes (one-fifth of a pound) of hydrochlorate of lime. A weak finish is produced by allowing the moistened pieces to pass through a calender in which the roller in the middle is covered with felt or cloth. For obtaining a glazed finish, a machine is used consisting of 3 rollers, the upper and lower one of which are made of paper, that in the center of cast iron. This latter roller is hollow, and can be heated by steam. By means of levers or screws these rollers can be pressed more or less compactly together.

For the glazing finish the so-called friction calender is used. This glazing machine differs from the above-mentioned machine merely in the more rapid rotation of the hollow iron roller in the middle, which is effected by the insertion of an additional wheel in the mechanism.

For rendering the wefts similar to silk mohair, two finished pieces were formerly laid together and allowed to pass through the calender. By the pressure of the rollers of the calender, as the threads of the one piece are not parallel to those of the other, and therefore cross each other, the latter threads are pressed quite smooth, and a beautiful effect is thus produced. At present there are suitable machines employed for this purpose. They consist of a leather, paper, or wooden roller, and an engraved cylinder of copper or brass. Before the ware is passed through the machine, the paper or wooden roller must receive an impress of the engraving on the metal cylinder; this is effected by pressing the two rollers strongly together.

By employing a suitably-engraved cylinder all kinds of weft, as moreen, huckaback, quilting, reps, etc., may be readily imitated. Fine wefts, as jaconets, organdy, batiste, which are prone to contract, and whose threads often are drawn apart, must be strained after the process of finishing. The pieces, when finished and calendered are laid in certain layers, then sewed, marked, and finally pressed for some hours under a screw or hydraulic press.

The glazing finish is composed of 50 gallons of water, 40 kilogrammes of starch, and 9 kilogrammes of stearine, which which substances are boiled together for from 5 to 6 hours.

THE San Francisco Mechanics' Institute will open its Seventh Annual Exhibition, next September, in a building covering 70,000 feet of ground, and erected specially for the purpose at a cost of $45,000.

Correspondence.

The Editors are not responsible for the Opinions expressed by their Correspondents.

Krupp's Works.

MESSRS. EDITORS: Having been favored with a visit to the celebrated works of Fred. Krupp, Esq., of this city, I think that a description of what was seen there may not be uninteresting to the readers of your journal. I have within the past few weeks visited the most extensive establishments of a similar nature in England, and I find that most of them bear about the same relation to Mr. Krupp's works as a yacht does to the *Great Eastern*. That such a gigantic concern was built up, owned, and managed by one man is truly wonderful, and, in order that some idea may be formed of its extent, I give the following account, which was furnished me at Mr. Krupp's office: This establishment has been in existence forty-two years, and has steadily grown, year by year, until at present it covers a continuous surface of 450 acres, 200 of which are under roof. The men employed number about 14,000. In the year 1866, the works turned out 61,000 tuns of material, involving the use of 412 smelting, reverberatory, and cementing furnaces; 195 steam engines, varying from 2 to 1,000-horse power; 49 steam hammers, from 1 cwt. to 50 tons; 110 smiths' forges; 318 lathes; 111 planers; 61 cutting and shaping machines; 84 boring machines; 75 grinding machines; and 26 sundry and special tools. There have been large additions to the above within the past three years. At the present time 180 steam boilers are used, evaporating 200,000 cubic feet of water into steam of 4 atmospheres pressure every twenty-four hours; and about 13,000 gas burners consume, in the same time, 500,000 cubic feet of gas—the gas being lighted night and day. There are about 20 miles of rails traversing the works in every direction, upon which run 7 locomotives and 150 wagons.

The principal articles manufactured are Bessemer steel rails, crucible steel, breech-loading guns to 96,000 lbs. weight, cast-steel marine crank shafts, cast-steel locomotive crank axles with cast-steel disk wheels of 6 feet diameter.

Here is the largest forging steam hammer existing; the "drop" alone weighing 100,000 lbs., and the casting for the hammer block 300,000 lbs. The foundation for this hammer is 60 feet deep, built up with timber and iron. I saw this hammer in operation forging a gun of the largest dimensions. One of the great secrets of the succes in making huge cast-steel forgings lies in having the weight of the hammer so proportioned to the size of the forging as to move the entire mass of metal at each successive blow of the hammer.

While recently visiting the works of Messrs. John Brown & Co., Sheffield, England,—the principal productions of which are Bessemer steel and iron armor plates—I saw plates 9 inches in thickness. There is, however, a limit to the thickness of iron plates for vessels, for a ship may be sunk by the weight of her own armor. But let us see what Mr. Krupp is doing. I was shown a 1,000-pound rifle breech-loading gun resting upon a cast-steel carriage. This gun was intended for coast defense service. It consisted of an inner tube upon which was shrunk cast-steel rings. The inner tube when finished weighed 20 tuns, and was forged from a massive ingot of 40 tuns; and the cast-steel rings, forming a threefold layer at the powder chamber and a twofold layer at the muzzle portion, weigh about 30 tuns—total weight 50 tuns. The diameter of bore was 14 inches, the total length 9 feet 2 inches, the number of rifled grooves 40, depth of rifling 0·15 in. the twist of rifling 980 and 1,014·4 in., the weight of solid shot 1,212 lbs., the weight of shell 1,080 lbs., and the charge of powder from 110 to 130 lbs. (The weight of shell was made up as follows: cast-steel shell 843 lbs., the leaden jacket 220 lbs., bursting charge17 lbs.—total 1,080.) It required sixteen months to manufacture this gun, working day and night. This cannon reposes upon a steel carriage of the weight of 15 tuns and together they work upon a turn-table of 25 tuns. The total weight of cannon, carriage, and turn-table was 90 tuns. The gun carriage slides smoothly upon the turn-table, and the necessary mechanism for working the gun is such that one or two men can easily elevate, depress, and turn the gun, and can with the utmost certainty follow and cover any passing vessel. The cost of this gun mounted complete is $187,000 gold. There are in course of construction thousands of tuns of these guns of all sizes down to 4 pounders, all breech-loaders; and it is supposed that a single discharge of Mr. Krupp's 14-inch cannon will sink any iron-clad afloat. The cost of transporting one of these large guns would be enormous. No railroad car possessing sufficient strength, Mr. Krupp manufactured his own car entirely of steel and iron, which rests upon twelve wheels, the total weight being 24 tuns.

The coal bed which is beneath the works supply the necessary fuel, and the continual undermining has resulted in a sinking of the earth and consequent damage to the buildings.

I was shown locomotive driving wheels, 6 feet in diameter with hub, spokes, rim, and crank all forged in one solid piece; the outside flange tire being shrunk on and fastened in the usual manner. I saw also some railroad frogs of cast-steel, and was told that they were cast in the same kind of clay, or earth, of which the steel crucibles are made. They were as perfect as any cast-iron castings.

Mr. Krupp has orders from different governments for cannons sufficient to run his works for more than two years.

As I passed over this vast establishment and viewed the immense masses of steel and the various appliances for handling, turning, and moving each piece, I wondered that so much could have been accomplished in a life-time. But there is every facility here for keeping up such an establishment. Labor is cheap; mechanics about one $1 per day and ordinary labor from fifty to sixty cents. The surrounding country is all cut up into governments—some of which are of no larger population and of less territorial extent than New Jersey—and each must have its standing army. Little Belgium keeps in time of peace a standing army of 50,000 men. In passing over any part of this country one meets soldiers at every corner and finds them in almost every railroad car. All this implies a constant demand for the *matériel* of war.

I find that the mechanics of Prussia are very much dissatisfied with the patent laws of the country, as they afford very little protection or encouragement to the inventor, and therefore do not serve to promote the arts or sciences. In ordinary pursuits and more especially in agriculture, work is performed in the most primitive manner. There is little to stimulate the inventive power of the mechanic, and it is only in a few large establishments like that of Mr. Krupp's that the genius of the country is to any extent developed. I think that the people of Prussia possess mechanical talent to a high degree, and that under more liberal patent laws she would in a short time stand side by side with any other nation. In warfare no doubt Prussia is the terror of Europe. The inhabitants numbering about 20,000,000, and every man having been educated as a soldier, she is thus enabled to raise an army sufficient to cope with any power. Mr. Krupp's works alone could supply her with weapons—in fact no government works in the world can at present equal his in extent, or facilites for manufacture. When other governments are entering into contracts with Mr. Krupp for guns, they seem to lose sight of the fact that they are building up an immense establishment in another country, while they should by every means patronize and encourage home industry. Equal patronage would soon raise an enterprising American establishment to the high standing of Mr. Krupp's.

J. E. EMERSON.

Essen, Rhenish Prussia.

Explosive Compounds.

MESSRS. EDITORS:—I have read with much interest the articles which you have published on explosive compounds applicable for engineering purposes. The writer, however, does not give any information not hitherto known, and in gathering this he seems to have exercised but little discrimination. I will only refer to No. IV. of the series, respecting nitro-glycerin. In this article he gives little except what can be found in chemical works, and nearly one-half of the article refers to the oft-repeated accidents that have occurred with nitro-glycerin. But allow me to call your attention to a few of the author's assertions. In the first place, he states that nitro glycerin is made from one volume of nitric acid, specific gravity, 1·43, and two volumes of sulphuric acid, specific gravity, 1·83, and that it will congeal at 40° Fah. Practically considered, the specific gravity of the nitric acid is not sufficient, and nothing short of 46° will give a commercial yield. The freezing of nitro-glycerin varies from 42° to 44° Fah. Nobel says he has had it a liquid at 32° Fah.

In a frozen condition nitro-glycerin will not explode. An atom may be thawed by a blow, and the explosion of the atom will produce the detonation of the whole congealed mass. The scale for determining the explosive force of substances must be according to the expansion of the gases evolved. The writer gives 32,832 pounds as the average explosive force of gunpowder, because, on an estimate, a certain quantity of chalk was removed from the Dover Cliffs, of white sand, at Tunbridge, etc., with one pound of powder. He does not mention the quality of the powder, nor the conditions of application, whether or not the powder was placed so that the mere starting of the material would carry with it large quantities, as illustrated by chambering and barring. The expansion of gas developed on the explosion of an atom of nitro-glycerin may be thus considered. The chemical formula of nitro-glycerin is $C^6 H^5 O^3 (NO^4)$. Each 100 parts of exploded nitro-glycerin leave a residue of 20 per cent water; 58 per cent carbonic acid; 3·5 per cent oxygen; 18·5 per cent nitrogen; total 100. Specific gravity of nitro-glycerin 1·6, and one volume produces 554 volumes of steam; 469 volumes of carbonic acid; 39 volumes of oxygen; 236 volumes of nitrogen; total, 1,298, or nearly 1,300 volumes.

Artillery engineers have determined that only 33-100 of any charge of gunpowder can be exploded or converted into gas, but say 50 per cent, one volume giving 260 volumes, cold gas, deduction being made of the expansion produced by heat. Practically, however, the combustion is never so complete, and 200 volumes cold gas are, therefore, in all probability, above the real average result. It is difficult to determine the degree of heat produced by an exploding substance. According to theory, however, nitro-glycerin, on account of its complete combustion, ought to develop a much greater heat than gunpowder, and this is often shown by the rock located near the charge in a blast. The rock is disintegrated, and the hardest stone is easily broken with the hand. The heat evolved may be safely considered to be three times greater than that thrown off on the explosion of gunpowder; but I will base my estimates upon twice the degree of heat. The above facts being realized, we may conclude that, if one volume of gunpowder gives 200 volumes cold gas (practically, however, only 173 volumes), expanded by heat four times—equaling 800° of explosive force, and nitro-glycerin cold gas as above given, at 1,300 volumes, expanded by heat eight times—produces 10,400 volumes; so that nitro-glycerin, compared with gunpowder, possesses about thirteen times its power when volumes are considered, and eight times, considering weight, the specific gravity of gunpowder, being 1·0. In hard or wet rock, nitro-glycerin remains without an equal, and the particulars regarding the results of practical blasting must be considered in a future communication. What we fail to learn in the series above referred to, are practical experiments in the disruption of matter by these different explosives under like conditions. It is not for me to suggest how these experiments may be made, and perhaps the only way that their powers can be determined is by considering their chemical forces. The writer seems to suppose that nitro-glycerin has passed from any use in practical blasting. That may be so in the British Isles, but he ought to remember that the people of that country are very slow, and that men of enterprise have to struggle long, and with much patience, to get them to adopt new improvements, even after the commercial value of an invention is beyond doubt.

TAL. P. SHAFFNER.

Galvanized Iron Water Pipes.

MESSRS. EDITORS:—An article in No. 18, Vol. XX. May 1st, asks if galvanized iron pipe is fit to convey water for culinary purposes. I will give you my experience. About six years ago I put down some 60 feet of 1½-inch galvanized iron pipe, to convey water to my kitchen. Galvanic action took place immediately, and the water become so offensive from hydrogen gas liberated, that we could hardly stay in the room. My pump worked so well that I thought that I had better try to remedy the defect, so I proposed making a thin wash of hydraulic cement to coat the inside; but before trying it a heavy rain muddied the water in the well, and when it had settled and become fit to use, it had lost all the offensive taste and smell and has been good ever since. I would recommend a very thin wash of hydraulic cement and not wait for the rain.

P. M.

Paterson, N. J.

[The reaction described by our correspondent always occurs, to a greater or less degree, when water is first admitted to a galvanized iron pipe. The zinc is oxidized at the expense of the water which leaves hydrogen free. No harm, however, is to be apprehended from the effects of this gas, except a trifling temporary inconvenience. It is the subsequent dissolving of the oxide of zinc that renders the water hurtful. This we have shown does not take place except when impregnated with substances specified in the article referred to by our correspondent. If the water is free from these substances the use of cement is unnecessary, and if they are present such pipes should not be used.—EDS.

Extinguishing of Kerosene Lamps.

MESSRS. EDITORS:—A kerosene lamp will be found extinguished in less than one minute from the time of complete disappearance of wick below the edge of tube through which it passes; care being taken not to turn it out of reach of that part which controls the action upward and downward. It is better to allow it remain turned down till relighting—absorption does not occur, gumming is avoided, and destruction of wick is retarded very materially, as the wick is constantly chargedwith oil. But if turned up after being extinguished, the wick becomes dry, and quite an amount thereof is consumed before concommilitant actions of combustion come into play. Blowing into the chimney, or under it, is unnecessary, and quite unphilosophical, as a deleterious gas is evolved until wick and tube cool.

ENTERPRISE.

Cincinnati, Ohio.

IMPORTANT DECISION ABOUT DESIGNS.

We call the especial attention of our readers to the decision of the Commissioner of Patents, published in another column, respecting an application made by Jason Crane for a patent for a design for box for ladies' furs. This decision is a very important one, as it determines the full scope and meaning of the statute of 1861, which was intended to afford a wide and liberal protection to certain useful articles of manufacture, such as did not come within the exact meaning of a "mechanical invention" or of an "ornamental design." We regret to say, however, that the plain purport of this law has been defeated by the Examiner in charge. He has persistently refused, so far as our experience goes, to allow patents except for works of art, or for some ornamental configuration or design. The law of 1861, which was intended to be an improvement on the old law, has failed, either through obstinacy or ignorance of the true intent of the law, to benefit those for whom it was enacted. It is, therefore, with great satisfaction that we record this decision. The law is expounded to mean exactly what we supposed it did mean, and we trust that the Commissioner will see that the practice of the office in this particular is made to conform to the decision.

New Method for Working Large Ventilating Fans.

A new method recently invented in England for driving the Indian "punkah," or fan, for which coolies have been hitherto employed, seems equally applicable to the driving of the large ventilating fans, used for promoting circulation in dining rooms etc., in this country.

The mechanism of this contrivance is of great simplicity, and its perfect noiselessness is said to be one of its chief recommendations—the faint ripple of the linen "punkah" being heard amid the complete silence of the wheels that move it to and fro. A dead weight and train of wheel work give motion to a horizontal shaft and fly wheel, a slight jerk of the fan being given at each revolution of the wheel and oscillation of the fan, by the simple device of weighting one side of the fly wheel. This action imitates with admirable nicety of effect, the movement of the wrist when the "punkah" is worked by an attendant.

FORTY mines in the White Pine (Nevada) district are named after General Grant, and nearly an equal number bear Sheridan's name in various forms. Morning Stars, Evening Stars, North Stars, and all sorts of fanciful appellations abound. Over 3,000 claims in all have been recorded.

VIEWS ON THE CENTRAL PACIFIC RAILROAD.

To those unacquainted with the locality it is impossible to convey by description any adequate idea of the irregularities of surface which occur in the Sierra Nevada mountains, which are traversed by this line. The tunneling required has been of small extent. The peculiarity of the line is the very extensive employment of trestle bridging, and it is with the view of illustrating this that our engravings have been chosen, Nos. 1, 2, 4, 5, and 6, being examples of trestle bridging, and No. 3 showing a cutting 63 feet deep and 800 feet long through cemented gravel and sand, of the consistency of solid rock, and which is only to be moved by blasting. The trestle bridging has been all constructed as strongly as possible, and of the best obtainable material. The ties, stringers, and caps are of best quality pine (that from Puget's Sound, nearly equal to oak), and the posts, braces, sills, and piles of red wood. The main posts, 12 inches square, are placed perpendicularly, let into a sill of the same dimensions with mortice and tenon, immediately under the bearing of the track stringers. Outside the main posts, two posts 12 in. by 12 in. extend down, with a run of 1 foot in 3 inches to the sill to which they are tenoned, beside being bolted at the top to the main posts with inch bolts and cast-iron washers. The sills rest on piles on stone foundations. Piles, when used, are driven so as to come directly under the main posts and braces. The posts are capped with a timber 12 inches square and 9 feet long, into which the posts are tenoned and pinned. Upon the caps rest corbels 12 inches square and 9 feet long, and upon them are laid the stringers, 12 in. by 15 in., secured by iron bolts passing down through them to the corbels. The caps are notched 1 inch to receive the corbels. The cross ties, or sleepers, are securely fastened to the stringers, and upon the sleepers are laid the rails in the ordinary manner. The "bents" or frames are placed at intervals of 15 feet from center to center. Trestling thus constructed is said to last from eight to fifteen years. When necessary it can be renewed at small cost, or filled with earthen embankment by transporting material on cars at far less cost and trouble than would have been incurred in constructing an embankment at first.

It now takes three weeks or more to reach San Francisco *via* Panama, from New York. When the line is complete the journey can be made in seven days, and ultimately, without doubt, in even less time.

No. I.—TRESTLE OPPOSITE AUBURN.

No. II.—TRESTLE AND TRUSS BRIDGE, CLIPPER RAVINE, 100 feet high.

No. III.—BLOOMER CUT, 63 feet deep, 800 feet long.

No. IV.—LONG RAVINE, HOWE TRUSS BRIDGE AND TRESTLE, 120 ft. high.

No. V.—TRESTLE AT SECRETTOWN, 1,000 feet long, [illegible] feet high.

No. VI.—FIRST TRESTLE IN CLIPPER RAVINE.

Prof. Tyndall's Lectures on Light.

Prof. Tyndall has commenced a series of lectures on "Light," before the Royal Institution. Their publication will be awaited with eagerness on this side the Atlantic by those who have read his works on heat and sound. His opening address was of a very elementary character, but he introduced a new experiment to prove that the angle of incidence of light is equal to the angle of reflection. A rod of brass, graduated in inches, was supported in a horizontal position, and from its center a thread, drawn tight by a plummet descended into a basin of water, colored with ink in order to get rid of all but surface reflection. A small dimple was necessarily made at the place where the thread entered the ink. A small paraffine lamp was then placed with its flame nearly touching the rod, and at about a yard from the central thread. Upon bringing the eye along the other end of the rod, and watching the small dimple in the water, it was seen to be most brilliantly illuminated when the eye was at the distance of a yard from the center of the rod, thus proving that the angle of incidence is equal to the angle of reflection. To whatever distance the lamp was shifted from the central thread, the eye had to be placed at a similar distance on the other side to get the most brilliant reflection.

Blazing Stars.

In the year 1866 a star blazed up in the constellation of the Northern Crown, rapidly attaining the second magnitude. It soon began to decline in brightness, falling in twelve days to the eighth magnitude. It was subjected to spectroscopic observation by William Huggins shortly after it began to fade. This experienced observer was surprised with the phenomenon of two distinct spectra. One of these was the ordinary spectrum of dark lines, showing the existence of a photosphere of incandescent solid or liquid matter, inclosed in a vaporous atmosphere. Overlying this was a spectrum consisting of four bright lines. This plainly proved the existence of a second source of light, shown by its peculiar spectrum to be a luminous gas. Two of these lines were the prominent hydrogen lines, and their great brightness showed the gas to be hotter than the photosphere. The conclusion was obvious: the observer beheld a blazing world. A sudden flood of free hydrogen gas had apparently burst from the interior of the star, and was fiercely burning in contact with some other element. The intense heat of this conflagration had also heated the photosphere, so as to render its spectrum more vivid. If, then, the stars are thus liable to become enwrapped in the flames of burning hydrogen, we may speculate as to what would be the fate of the inhabitants of the planets were our sun to emulate the vagaries of its sister orbs and burst out in mighty conflagration.—*From "Spectrum Analysis," in Lippincott's Magazine for May.*

Modern and Medieval Architecture.

It is a sad truth that there is something in the solemn aspect of ancient architecture which, in rebuking frivolity and chastening gaiety, has become at this time literally repulsive to a large majority of the population of Europe. Examine the direction which is taken by all the influences of fortune and fancy, wherever they concern themselves with art, and it will be found that the real, earnest effort of the upper classes of European society is to make every place in the world as much like the Champs Elysées, of Paris, as possible. Wherever the influence of that educated society is felt, the old buildings are relentlessly destroyed; vast hotels like barracks, and rows of high square-windowed dwellings thrust themselves forward to conceal the hated antiquities of the great cities of France and Italy. Gay promenades, with fountains and statues, prolong themselves along the quays once dedicated to commerce; ball rooms and theaters rise upon the dust of desecrated chapels, and thrust into darkness the humility of domestic life. And when the formal street, in all its pride of perfumery and confectionary has successfully consumed its way through the wrecks of historical monuments, and consummated its symmetry in the ruin of all that once prompted to reflection or pleaded for regard, the whitened city is praised for its splendor, and the exulting inhabitants for their patriotism — patriotism which consists in insulting their fathers with forgetfulness and surrounding their children with temptation.

Is this verily the end at which we aim, and will the mission of the age have been then only accomplished when the last castle has fallen from our rocks, the last cloisters faded from our valleys, the last streets, in which the dead have dwelt been effaced from our cities, and regenerated society is left in luxurious possession of towns composed only of bright saloons, overlooking gay parterres? If this be indeed our end, yet why must it be so laboriously accomplished? And are there no new countries on the earth, as yet uncrowned by thorns of cathedral spires, untormented by the consciousness of a past? Must this little Europe—this corner of our globe, gilded with the blood of old battles, and gray with the temples of old pieties—this narrow piece of the world's pavement, worn down by so many pilgrims' feet—be utterly swept and garnished for the mask of the future? Is America not wide enough for the elasticities of our humanity? Asia not rich enough for its pride? or among the quiet meadow lands and solitary hills of the old land, is there not yet room enough for the spreadings of power or the indulgences of magnificence, without founding all glory upon ruin, and prefacing all progress with obliteration?—*John Ruskin.*

Simplicity is one of the greatest elements of utility in machinery. Complexity should, if possible, be always avoided.

Scientific American.

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Contents:

(Illustrated articles are marked with an asterisk.)

DISCUSSION OF PURELY SPECULATIVE TOPICS—TO CORRESPONDENTS.

We are always glad to give our correspondents a hearing upon subjects which we consider likely to be beneficial to our readers at large, but we find it necessary occasionally to hold our correspondents in check. At the present moment we find our desk loaded down with articles upon purely speculative topics, involving abstract theories which have puzzled the wisest of all ages. We cannot give up our columns to the discussion of such subjects, as very little can be evolved therefrom, either new or profitable to our readers. We prefer something practical, something that shall add to the general stock of useful knowledge, and aid in promoting and developing the industries of the world.

Let us enumerate some of the topics contained in this heap of rejected correspondence. We have several upon the "Fluid Character of Electricity;" another upon "The Cause of the Attraction of the Positive Pole of a Magnet for the Negative Pole;" another, which comprises as nearly as possible all the speculative inquiries of past and present ages, and which demands answers to no less than seventeen "whys," all pertaining to force considered as an abstract entity, and the origin of all existence; another upon the "Origin of all the Forces upon the Earth;" another upon the "Solidity of the Earth's Center," and so on to the bottom of the pile. Every one of these letters has been carefully read and considered.

What possible good can arise from the discussion of these and cognate subjects? We maintain that "why matter is and why matter moves" must, from the very nature of the case, remain beyond the pale of legitimate physical science, whose province it is to investigate the manner and succession in which natural events transpire, and not *why* things exist. The latter inquiry is either a subject for religious belief, or of speculative and transcendental philosophy, if that deserves the name of philosophy which is founded upon mere hypothesis. We know nothing of abstract force except by inference, if inference can be called knowledge. All that we can demonstrate is that matter under certain conditions moves in a manner always the same when the conditions are the same. This relation of motion to the conditions which precede it, is what we call law, a term which, in its physical sense, means only the constant relation which exists between any particular motion and the perceptible conditions under which it takes place. So far as we can see, matter and motion are always connected. If this is the result of an occult force, we know nothing of that force, and consider it impossible to demonstrate its existence. If its existence be admitted, we consider it just as legitimate a subject of philosophical inquiry to ask what underlies that force, and so on without end. If a first cause for matter and motion is a necessity of thought, what is the use of supposing intermediate causes between the first cause and matter and motion? We must finally stop at a cause uncaused, if we substitute a thousand intermediate causes. Why not say God created matter and put it in motion, and out of these facts, matter and motion, we have our universe? In this view, as soon as we step beyond matter and motion, we are in the presence of the first cause, Deity himself, and beyond the realm of physics. But it may be said the speculative theories which have suggested our correspondents' inquiries pertain, at least some of them, to this realm. We consider them of no greater value on that account. If their tendency was to point the way to probable discovery, they might be of some value; but so far as we can see, they do not: their discussion can therefore be of no benefit. We trust our readers will not permit their attention to be distracted from practical questions. It is futile to seek by scientific methods for the "*why*" of existence, but we may find out the "*how*" of many things that will confer good upon ourselves and our fellow men. This is the lesson we set out to teach.

EXPLOSIVE COMPOUNDS.

The subject of explosive compounds for engineering purposes, which has been discussed in several late numbers of our paper, has attracted considerable notice, and though the articles in question have been valuable, they fail to give that precise information which practical men desire, especially in this country, where energy and enterprise are developed in the highest degree. Mining men wish to know what explosive will do the most execution, considering safety and expense, which includes "time" as well as actual outlay of capital. For example, a railway may have a tunnel to complete before the road, previously constructed, can be made available. At the Hoosac tunnel it is estimated that, with nitro-glycerin, the opening can be made from one to two years earlier than it can be done with gunpowder. We are also informed that the Union Pacific Railway has used large quantities of nitro-glycerin to hurry the completion of a tunnel, and in order to get even a small quantity, the contractors purchased a car, and sent with it, at considerable expense, a messenger to hasten it forward. These are practical evidences in regard to nitro-glycerin. But, then, we must not omit to consider the efficiency and relative safety of other modern explosives. In California, dynamite, or giant powder, has been introduced into over 700 mines. In Pennsylvania, the oriental powder has been considerably pushed, with some degree of success. Periodically, the world has thrust upon it, some new development in the useful arts, and, at the present, we have a variety of explosive agencies, forcibly recommended by inventors, each claiming superiority for their respective products, and each claiming positive safety. Before the questions are satisfactorily solved, commercially considered, there will be some loss of life, and we cannot do more than to hope that the loss will be small.

Colonel Shaffner, whose letter appears in another column, gives no information relative to the explosive point of the substances enumerated, when produced by concussion.

Gunpowder will explode at 600° Fah., Horsley's powder (called in America, Ehrhardt powder), at 430°, gun-cotton from 350°, Schultz's sporting powder 385°, nitro-glycerin 360°, and percussion cap fulminate 340° Fah. These respective degrees of explosion mean, that when each is put in a vessel or room, they will explode when the temperature given is attained. But who can tell the exploding point under conditions of percussion—under a tap of the hammer, whether of metal, stone, or wood? Each explosive may have thrown around it all the precautions of safety, but, after all, mining men will have the article that will best subserve their interests, and, thus considering the subject, we can only indulge the hope that a proper regard for human life will not be overlooked by manufacturers and consumers, and that they will exercise those precautions which will lessen hazard and secure success to the greatest number.

Among the most hazardous of all the explosives claiming the attention of engineers, nitro-glycerin undoubtedly stands at the head, and its efficiency over that of its derivative, dynamite, is not sufficient, in our opinion, to compensate for the hazard involved in its use and transportation. We feel it our duty to express a decided preference for dynamite, where a very powerful explosive is required. The frightful accidents which have occurred from the use of nitro-glycerin, have no parallel in the history of any other explosive compound, and when we take into consideration the difficulty in enforcing care in its handling and packing, we do not hesitate to assert our opinion that its indiscriminate use should be prohibited by statute.

We see that some foreign papers take opposite ground in regard to safety attending the manufacture of the Schultz sporting powder, from that taken by the author of the series of articles which have been called in question. In order that our readers may judge for themselves, we publish, in another column, a description of the process by which it is made. The subject of explosive compounds is an important one, and worthy of the fullest discussion.

COMPLETION OF THE PACIFIC RAILWAY.

The announcement is made that the Pacific Railway is completed. Amid the conflicting statements in regard to the manner in which the work has been performed, we know not whether the people ought to rejoice or to feel sorry. It is generally admitted that the road has been laid in an imperfect manner. Some will even have it, that it is a mere sham, only built as a matter of form to obtain the very liberal subsidies granted by the Government. This may be an extreme statement, but between those of the friends of the enterprise and its foes, there is room for no little fear that the immense franchise granted to the company has resulted in no adequate return to the people at large.

If this should prove to be the case, through want of vigilance on the part of the Government, we see no reason to find fault with the company. As business experts they would naturally give only what was demanded of them. The Government has had it in its power at any time to withhold its aid until the terms of the charter were complied with, and if the company have found pliant tools in the Government officials, who were willing to rob the people for their own profit, it was to be expected that they would use them.

We are confirmed more and more by daily developments in the belief that such enterprises should be either carried forward entirely by the Government, or accomplished solely by private enterprise.

The system of making appropriations in aid of such works, is a vicious one, leading naturally to official corruption and fraud.

It is loudly asserted, in many quarters, that the company have made too much money, and that they have at least attempted to cheat the Government. If the latter part of this charge is true, and if it means that the acceptance of inferior work has been sought by concealment of deficiencies, it ought to divest the corporation of all the privileges it holds under its charter. The former is no charge at all unless coupled with dishonesty. The right to make money, if it can be made honestly, is one nobody has hitherto denied either individuals or corporations. If the company have built as good a road as they contracted to make, we care not how much profit rewards their enterprise. If they have made their money dishonestly, and by performing their work in a manner inferior to the provisions of their contract, a remedy for the people ought not to be difficult to find, a remedy that will teach future solicitors for Government help, that it is dangerous to trespass upon the rights of the people. If, however, the cheating has been done through the honorable gentlemen who were stationed to guard the public purse, the public will transfer their wrath from the company to these offenders.

We should not envy the position of those gentlemen should the people find that they have permitted themselves to be derelict in their duty in this matter.

We give, on another page, a number of views taken from different points along the line of this road, which will interest those unacquainted with the peculiar features of the section it traverses.

AFFAIRS AT THE PATENT OFFICE.

Commissioner Fisher takes hold of the affairs of the Patent Office with an earnest purpose to effect a speedy reform of past abuses. He recently invited the Examiners and Assistant Examiners to his room, where some time was spent in interchange of views regarding the business of the office as it relates to the examination of cases, and he proposes to dispense with some of the present useless forms, in order to facilitate the procuring of patents. The Commissioner gave some opinions for the guidance of the Examiners, in order to secure more uniformity in the general practice of the office.

The following removals were made—viz., N. Peters, Examiner; D. Curle and C. L. Coombs, First Assistants; T. H. Sypherd, Second Assistant. Appointments were made as follows: John C. Tasker and George A. Nolen to be Examiners.

We are glad to learn that the present efficient Chief Clerk, Mr. Grinnell, is to be retained.

Mr. Tasker is a native of New Hampshire, and is a skilled and educated mechanic. He was, for several years, in charge of some of the most extensive works at Lowell, Mass; for the past three years has held a position as First Assistant in charge of the classes of wood working and of metal casting, and is said to admirably qualified for his new position. Mr. Nolan is a native of Massachusetts; was educated at Yale College, where he graduated with high honors, and was for some three years a tutor of mathematics and natural philosophy. He has been in the Patent Office as First Assistant about three years, and will make a most satisfactory Examiner.

J. W. Abert and J. H. Hawes have been appointed First Assistant Examiners; James Lupton and F. S. Lawson, Second Assistant Examiners. James Nowlands and D. Wilson have been promoted from Second to First Assistant Examiners. W. A. Gutplim and A. R. Robinson have been promoted from temporary clerks to be Second Assistant Examiners. Michael Marley has been appointed chief Messenger in place of Chas. W. Thomas, resigned.

We are assured that these appointments will reflect credit upon the Commissioner and the Secretary of the Interior.

Commissioner Fisher has granted an extension to M. M. & J. C. Rhodes for their patent for a machine for leathering the heads of tacks. In the testimony taken in the case it was shown that over six millions of this style of tacks were used in the United States daily.

An interference case of some importance, in relation to a device for sharpening millstones, has also been decided by the Commissioner. The parties who were immediately interested were J. F. Gilmore, of Providence, Ohio, who had secured a patent, and George Hermon, of Paris, France. The claims of Hermon were sustained.

DUST.

At this period of moving, most people become familiar with the general appearance of dust, and the peculiarly disagreeable sensations produced by its getting into the eyes, nose, and mouth. Few pause to consider what it is or where it comes from. We repeat the passage, "Dust thou art and to dust thou shalt return," but we hardly realize that the almost impalpable particles which exert their pungent power to compel us to sneeze, or cough, or make the tears to run down our cheeks, may be composed of the same matter that constituted the body of some ancestor a thousand years ago, and for whom we never felt called upon to weep until now.

Our readers will recollect the significant query, "Who ate Roger Williams?" and how it originated in the discovery that the body of that resolute controversialist had been appropriated to the growth of a greedy apple tree, which, not content with the theft, mimicked with its roots the body and limbs it had devoured. Of course the fruit produced on this tree, doubtless eaten with satisfaction, some of it perhaps by the descendants of Roger Williams, contained the very matter which once was a living being; and the same matter may have been a million times exchanged and transported, so that

the dust which is perhaps this moment provoking the reader to sneeze, may be a portion of that which once revolted against puritan persecution, and wended its way from the Colony of Massachusetts, to find a grave beneath a Rhode Island apple tree.

Dust is commonly regarded as being matter of death. But though upon examination with a powerful microscope we find it to contain myriads of skeletons of dead organic beings, we shall also find that we are not roaming in a microscopic grave yard merely. We shall find the reproductive bodies of the diatoms, about which so much has been written and said by microscopists as to whether they were plants or animals, finally resulting in the belief that they are plants. Ehrenberg has described several hundred kinds of diatoms found in atmospheric dust. There are also to be found encysted animalculæ and rotatoria, and their germs; spores or seeds of fungi, algæ, lichens, and other cryptogamic or flowerless plants, intimately mingled with particles, consisting of cells and portions of cells, of both animal and vegetable tissues, and finely comminuted mineral substances.

Among the latter, salts of sodium are some of the most generally diffused, although near bodies of salt water they are to be found in largest quantity, being carried into the air in the spray of oceanic waves, and afterward precipitated by the evaporation of the water which held them in solution. Silica, alumina, lime, and oxide of iron, are always found. Near manufacturing establishments there are always more or less of the materials used in the works to be found, as sulphur, oxides of the metals, and carbon deposited from smoke. In the vicinity of tanneries tannin may be found; and near dye-works, coloring matters.

Dust is so universally diffused throughout the atmosphere that no place within the limits of animated existence can be said to be free from it under ordinary circumstances. To remove it even from small quantities of air requires quite complex mechanical and chemical manipulations.

In regions subject to miasmatic diseases, organic matter is found in the greatest abundance in the form of spores. Its presence is determinable by a very simple test. Strong sulphuric acid has the property of freeing carbon from its combinations in organic substances. If a piece of wood be immersed in it it will be converted into charcoal. If then, a watchglass containing strong sulphuric acid, be exposed to the atmosphere the acid will after a time become blackened by the carbonization of the organic matter deposited upon its surface. It has been found that in malarial districts, sulphuric acid thus exposed becomes blackened much more readily than in other places, thus proving the presence of organic matter.

In view of these facts it will be seen that streets filled with dust, must be prejudicial to the sanitary condition of large towns, and that the laying of this dust by sprinkling, is more than a mere matter of comfort to their inhabitants. Our readers have been informed of the method adopted last year in London, *i. e.*, the use of solutions of deliquescent salts, to lay street dust, and of the success that attended the experiment. We have no doubt of the value of this method and urge its trial in the large cities of this country. The additional cost of the salts would probably be compensated for by the diminished necessity for frequent application, and the increased health and comfort of the people, as well as the saving to merchants of the damage to their wares, frequently a serious matter along dusty thoroughfares.

THE VELOCIPEDE IN EUROPE.

One of Hood's quaintest fancies is carried out in sober earnest in London, according to the London *Daily News*, which says: "The academy at which old boys were put out to board, and from which one of the pupils describes how his fellows cannot play at marbles because the game necessitates stooping, and their rheumatics are so bad; or how hoop is rendered impracticable by gout, or prisoners' base by asthma, or details equally incongruous—this description is realized almost literally at the velocipede riding schools. These abound in London just now. East, west, north, and south of the metropolis are lessons being given to men of all ages, with a decided run upon bald heads and gray hair among the pupils.

"Down St. Luke's Hospital way, and about midway between Moorgate station and that Goswell street which has become classical ever since the embarrassing scene which took place in it between Mr. Pickwick and Mrs. Bardell, is one of the best known of the velocipede schools. From ten in the morning till six at night it is very busy. A couple of broughams and several hansom cabs are waiting at the archway, leading to it out of Old street, at the time of the visit. Past these, and up a sort of court, and we are in a large factory, with crowds of mechanics busily at work. Velocipedes in various stages of progress are to be seen everywhere. They hang in thick rows like onions from the roof, they block up the floor, they are piled in pyramids against the walls. The majority are unfinished. Long lines of wheels, unvarnished and unpainted, are seasoning, while handles, seats, axle trees, and smaller wheels are being manipulated, or lie ready for use. There is as much scope for fancy about the decorations of a velocipede as in aught else, and whether one of the scores which were being made to order should be picked out with yellow or red as a relief to its dark body color was a subject of earnest discussion between two elderly officers during our stay. The guiding bar is one of the things upon which extravagance is expected to center. Already we were shown a very handsome one in burnished steel and with ivory handles as an 'extra,' and that 'we shall have to bring them out in silver before the season's over,' is an opinion confidently expressed.

"So far we have kept to the manufactory and its approaches. The riding school is beyond. The first-named place and the counting house adjacent have been full of signs of the sudden and enormous demand which has arisen for the last new hobby horse, while the school shows us how devotedly purchasers are qualifying themselves for riding it. Here is a stout country gentleman who has come up from a distant province for the sole purpose of receiving lessons. A stalwart attendant walks with him round the room, holding him on his velocipede, by keeping an arm firmly round his waist. The sitter keeps his head down and his knees in, as if he were attempting to master a particularly vicious and unmanageable young horse. His eyes are firmly fixed upon the wheels beneath him, his shoulders are up, his teeth are clenched, his hat is pressed resolutely over his eyes, and his entire demeanor is that of a man who sees his work cut out for him and who means to master it. At first his feet are allowed to hang uselessly down, while the attendant propels the velocipede by pushing it with his disengaged hand. The rider is directed to keep his attention to the handle, to balance himself by it, and to be careful at the turns.

"Round and round the vast bare chamber go the twain, the attendant walking slowly under his double task, and giving out instructions rather disjointedly for lack of breath, 'Give a looser hold to the handles, sir—(puff)—don't grip 'em as if you were afraid of tumbling off—(puff, pant, puff). I'll take care of that. (Pant.) Just feel 'em like; the lighter and gentler the better—(puff)—and whenever you feel your'r going over on one side, just turn an opposite handle, and you'll right yourself directly.' (Pant, puff, puff.) After a little time the novice is told to use his feet, and he then turns the wheels slowly for himself, being still held on by the attendant instructor. There are no fastenings for the foot—simply a rest which projects out from the axle trees; and whenever the handle is mismanaged, and the center of gravity lost, the rider comes to the ground on his feet, and so stands up in a very comic way. It is as if a very tall man were on a pony so small that he can at any moment allow it to run between his legs. But there is nothing corresponding to the stirrup in any way; and one of the most striking things we noted was the readiness with which even the least expert of novices could place himself at ease, by freeing himself altogether of the machine. Two such lessons as we saw given, would, we were assured, enable the gentleman before us to manage a velocipede for himself, and from this stage to a complete mastery, is a mere question of practice."

At a recent meeting of the Society of Inventors, in London, a paper on velocipedes was read by Mr. C. B. King, C.E. He began by noticing the gradually increasing public interest in the velocipede movement in England, as well as in America and France; and having given to a native of the latter country the credit of the invention of the bicycle half a century ago, he mentioned the names of various improvers from that time down to the present. One of their machines weighed half a tun, and would carry twelve persons; in another the brake, one of the most valuable features of the modern velocipede, was introduced. In order to bring them into general use, manufacturers should pay attention to springs, proportion, and finish. The exercise might be called "walking made easy," with the advantage of taking ten feet at a stride in place of two. He attached no importance to the supposed danger to pedestrians, inasmuch as, with ordinary skill, a velocipedist can stop more suddenly than he could pull up a horse. In America, with their usual appreciation of new ideas, they had established "Velocinasiums," and had invented such terms as "wobblers," "shavers," and "tumblers," to describe the several degrees of inefficiency of management. He urged, however, that, as a means of rapid and easy locomotion, the velocipede was well worthy of serious attention.

During a discussion which followed, it was suggested that inventors should endeavor to provide velocipedes suitable for ladies and children, as well as cheaper vehicles, on which working men could go to their employment, as some do in Paris. It was stated, however, that velocipedes are not fitted for London streets, and regret was expressed at their exclusion from the parks. Mr. Velogne said he had done the ninety miles between Paris and Rouen on a bicycle in one day. A mile had been done on good road in two minutes and four seconds: but the keeping up of so high a rate of speed was altogether exceptional. Eight or nine miles an hour would be done by an ordinary skillful man without great exertion. It was objected that at a tollgate on the Brighton road, velocipedes are charged under the same category as mules and donkeys. After the meeting, several bicycles were started, and did good work in Trafalgar Square, the Strand, and Fleet street.

At a sensation velocipede exhibition given, recently in Boston, one Master John Reardon is stated to have ridden a velocipede with grooved wheels along a rope stretched from one end of the rink to the other, about twenty feet from the floor. In addition to this a trapeze was hung to the velocipede and Mr. Harry M. Stevens performed a variety of feats upon it, while the velocipede was moving along the rope. Two little girls, aged three and five years, rode velocipedes around the rink with the ease of experts.

Mr. Henry C. Platt, of Augusta, Ga., sends us a drawing copied with the following extract from page 434, Vol. 5, of the "Second American Edition of the new Edinburgh Encyclopedia," printed in the year 1814.

"In the 'Triumph of Maximilian,' a work executed in the years 1516, 1517, and 1518, curious readers will find plates of various carriages or cars, some drawn by horses, some by camels, some by stags, others impelled forward by means of different combinations of toothed wheels worked by men. Of one of the most remarkable of them we give an exact copy in plate CXXXI (of which the drawing is a *fac simile*)."

The drawing is extremely curious, and the machine is evidently a monocycle. We have sought in vain for the work alluded to in the public libraries of this city. Is it available to any of our correspondents? If so we shall be happy to hear from them.

Editorial Summary.

A sprightly young paper published at Trenton, N. J. called the *Young Men's Monthly*, is devoting considerable space to the exposure of "Swindling in New York." Mayor Hall has also given a note of warning through the press against the numerous vampires who prey upon the credulity of the innocent and unsuspecting, but all labor bestowed in that direction will be temporary until people learn that the only safe course for them to pursue is to transact their business with reputable business firms. Gift enterprises are generally swindles; a great majority of advertised patent medicines are positively injurious to those who take them, and the public should beware of all advertisements that offer to send something for almost nothing. Such "catch-traps" are so numerous that we cannot undertake to name them; but of one thing our readers may rest assured—viz., that what cannot be purchased either of or through a respectable tradesman, is ordinarily not worth looking after.

Dr. Brown-Sequard, reports a curious case of a dog which had just died, having fresh blood passed into the carotid. The dead animal was revived, stood on his feet, wagged his tail, and lived over twelve hours, when he died again.

The above item is going the rounds of the newspapers. The error about the matter consists in the statement that the dog was actually dead. We undertake to say that the dog was but apparently dead. The simple introduction of fresh blood into the carotid of any dead animal would have no effect whatever.—We make this assertion on the authority of the New York *Medical Journal*, which announces in its last issue the death of a child under peculiar circumstances, adding sapiently to the statement that it was dead, *it could not be resuscitated.*

The *English Mechanic* in a recent issue discusses the defects in the British Patent System, and calls loudly for reform. It wants a cheaper system, one that will make patents more valuable, and less assailable by those who, lacking genius, cultivate cunning and roguery.—It appears that there is now a surplus patent fund amounting to the sum of $2,000,000, out of which it is suggested that an industrial and inventor's museum should be established and endowed, and that the present patent fee should be reduced one-half. The gross injustice of charging such exorbitant fees is fully shown by the enormous surplus which has been accumulated under the present system. We therefore hope that the suggestions of our cotemporary may prevail.

The work of clearing the obstructions at Hell Gate have come to an end for the present. Out of the general appropriation of $1,500,000 made by Congress for river and harbor improvements, the paltry sum of $80,000 only was allowed by the Secretary of War for this important work. We understand that Mr. Shelbourne, who was employed to blast out "Frying Pan" rock, has expended $20,000 out of his own pocket in preliminary experiments and preparations. This work is one of great national importance and ought to be vigorously pushed forward.

Professor Powell, who departed nearly one year ago in charge of the scientific expedition to explore the Rocky Mountains, has returned to Bloomington, Illinois, for the purpose of procuring four portable boats in Chicago, which are to be carried out on the Pacific railroad as far as possible. The party are to embark in these boats at the headwaters of Green river, and follow that and other streams into which it empties to the Pacific Ocean. The party will spend some ten months. Mrs. Powell has returned to Bloomington, and will not accompany the second expedition.

Protecting Birds.—The Legislature of Wisconsin, at its last session, passed a law making it a penal offense to destroy or kill, by any device whatever, brown-thrushes, blue-birds, martins, swallows, wrens, cat-birds, meadow-larks, or any other insect-eating birds, anywhere within two miles of any incorporated city or village in that State. The Legislature of Pennsylvania also passed an act, afterward approved by the Governor, which imposes a penalty of twenty-five dollars for the killing of any insectivorous bird, one-half of this fine to be paid to the informer.

The appropriation for the survey of the lakes this season is $100,000—much below the amount appropriated for 1868. The organization of the surveying parties has not yet been completed. It is proposed to finish the survey of Lake Superior. In addition to the other work, it is intended to continue the operation of gaging the rivers connecting the lakes, with reference to the supply and outflow of water. The problem is one of very great general interest.

The return of Dr. Livingstone, the veteran English traveler, was expected about four month since, but up to the present moment his movements are wrapped in mystery. At last accounts, December 14, 1867, he was proceeding along the eastern shores of lake Tanganyika, but no idea can be formed respecting his subsequent course. His fate is regarded with some degree of uncertainty.

English coach builders are beginning to announce that they are prepared to build light carriages on wheels imported from America. They have discovered at last that the Americans are half a century ahead of them in the matter of carriage building.

HONOR TO AN AMERICAN CITIZEN.—A telegram from Paris, May 4th, announces that the Geographical Society of France have decreed a gold medal to Dr. Hayes, of the United States, for his eminent services in the work of Arctic exploration and discovery. That day the president of the society, with a deputation of members, waited upon General Dix, the American Minister, and presented the medal, requesting him to transmit it to his distinguished countryman, and accompanied the presentation with an earnest aspiration for continued friendship between France and America. General Dix, in reply, thanked the president for his friendly expressions in regard to his country, and said it was a true pleasure for Americans to see France and the United States working together in traditional friendship for the promotion of discovery, science, and general progress.

CHIMNEY SWEEPING EXTRAORDINARY.—The Amsterdam Soot Company, is the name of an association of chimney sweeps in Amsterdam, Holland. The director has the title of "Royal Chimney Engineer." The managing agent is a distinguished advocate. The company have also a set of commissioners designated by the government, comprising an inspector of public works, a great diamond merchant, already president of one industrial association, and an architectural engineer, who is also a manufacturer. The company has for its business the sweeping of chimneys and trade in soot.

SCIENTIFIC EDUCATION.—The Lafayette College, Easton, Pa., has established a scientific department, A. Pardee, of Hazelton, Pa., having generously placed the sum of $300,000 in the hands of the trustees for that purpose. The department embraces a thorough technical course of study, with an able corps of professors. We are pleased to notice that a number of scholarships have been placed at the disposal of the faculty, for the benefit of young men of talent and good moral character. Application for these scholarships should be made to the President, W. C. Cattell, D. D.

THE manufactures of Baltimore are growing. The *Sun* of that city says: "In different quarters new establishments are appearing, and the indications are of a steady advancement of Baltimore as a manufacturing city. Baltimore has long been celebrated for the building of locomotives and marine engines, for her machine shops, rolling mills, agricultural implement establishments, and other branches of mechanical production, but there are other manufactures of more recent growth and of considerable importance."

WITH microscope and blowpipe, Mr. Sorby is developing a new method for the examination of minerals. He fuses a small portion (a bead) of the substance to be examined in borax, adds various re-agents according to circumstances, keeps the bead at a dull red heat for a short time, when crystals appear characteristic of the substance, and in some instances singularly beautiful in form. The whole process can be seen and the crystals identified under the microscope.

THERE is no other spoken language so cheap and expressive by telegraph as the English. So the electric wires are becoming teachers of our mother tongue in foreign countries. The same amount of information can be transmitted in fewer English words than French, German, Italian, or any other European language. In Germany and Holland especially, it is coming to be a common thing to see telegrams in English, to save expense and ensure precision.

PROFESSOR N[illegible] of the Faculty of Sciences of Nancy, in France, recently met his death in a very peculiar manner by accidentally inhaling the vapor [illegible] fluorine, [illegible] in making experiments to isolate fluorine. Professor N[illegible] was the author of many valuable published scientific works.

Commissioner of Patents.

Grant is making many judicious appointments, but none more fit and appropriate than that of Col. S. S. Fisher, of Cincinnati, as Commissioner of Patents. Col. Fisher is one of the most able and successful patent attorneys in the country. He is the author of "Fisher's Reports," the only compilation of [illegible] years. He [illegible] man that could be found on the continent.

We copy the above from the *Sorgo Journal*, published at Cincinnati, the home of Col. Fisher. It fully confirms all that we have said respecting him, and inventors have reason to thank General Grant for his careful consideration of their interests in making this selection.

Flooring Tiles and Slabs made from Slate Refuse.

T[illegible] accumulation of refuse in the slate quarries [illegible] to convert it into paving tiles and other useful [illegible]. This slate, with a certain proportion of river [illegible] harder than the slate from which they are [illegible].

DECISION OF THE COMMISSIONER OF PATENTS ON DESIGN APPLICATIONS.

[illegible] boxes for that purpose [illegible] arrangement of their compartments was [illegible] any improvement [illegible] no necessity for the distinction. There is a large class of manufactured articles that are not regarded as new in [illegible] to extend to a class [illegible] industry [illegible] configuration or arrangement [illegible] the provision [illegible] construction given to the statute by the Board of Appe[illegible]

MANUFACTURING, MINING, AND RAILROAD ITEMS.

Improved systems of extraction by the use of steam power appears to have exercised a beneficial influence on the mining industry of Prussia. In 1857 there were 1,287 mines worked in Prussia, giving employment to 93,161 miners. In 1867 this number had increased to 2,132, with 43,251 miners. The total value of the mineral production, which in 1857 was 550,000, in 1867 amounted to upwards of 8,500,000.

Jay Gould has notified the Postmaster General that unless the Department [illegible] Erie railroad service from $100,000 to $120,000 [illegible] mails. The Postmaster General has informed Mr. [illegible] that this exorbitant demand cannot be acceded to. The pay now received by the company is the same per mile per annum as received by the Central and other roads.

A writer in *Hearth and Home* has found the best way to take starch out of [illegible] Make strong soap suds, and dip the goods in it and hang them out to dry without wringing. They will be perfectly soft and free from starch and nice to work either by hand or [illegible].

A railroad route has been surveyed from Pittsfield, Mass., to Hartland and [illegible] and Hartland. The route [illegible] be built for $10,000 a mile. The legislature has authorized [illegible] to loan their credit for twenty per cent of [illegible]

[illegible] stated that the committee of [illegible] proposals for deepening the [illegible] unused, for deepening the passes.

A railroad tie, of polished California laurel, mounted on each end with solid silver, accompanied by a spike of solid gold, costing $[illegible], was forwarded from San Francisco, on May 4, to the end of the Central Pacific Railroad. It is the last tie and was to be laid by Leland Stanford, on Saturday, May 8, thus completing the Pacific Railroad.

The *Vancouver Register* says that an extensive coal bed has been discovered on the east fork of Lewis River twenty miles from Vancouver. The vein is fourteen inches thick and seven feet in width.

A large amount of lumber and iron ore will be landed at Michigan City, Iowa, this season. One contract is for 7,[illegible] tons of ore; and firms in Lafayette have contracted for the delivery of 4,000,000 feet of lumber and 3,000,000 shingles and lath.

A company has been organized, with the capital subscribed, to construct a telegraph line from St. Louis, through Texas, to the Pacific coast. Some [illegible] Washington to perfect the arrangements.

[illegible] Munch Bavaria, [illegible] in progress is Rogers' monument for the soldiers of Rhode Island, which the contract has to be finished and delivered at Providence about a year from this time.

The Commissioner of Internal Revenue has decided that the conditions printed on blanks for telegraphic messages are in the nature of an agreement and must have a five cent stamp.

In 1852 there were 1,247 patents in force in England. In 1868 the number had increased to 11,[illegible] including [illegible] "prolongations."

Boston firms send about 17,000 casks of nails a month for building purposes all over the country, and dispose of nearly 2,000 each month at home.

In 1861, the boot and shoe manufacture of Baltimore amounted to only [illegible] the same time, and the [illegible]

The iron founderies of Troy, N. Y., are all running on full time and employ an unusually large number of men.

Several locomotives were shipped lately from Paterson, N. J., for [illegible]

Inventions Patented in England by Americans.

[Compiled from the Journal of the Commissioners of Patents.]

PROVISIONAL PROTECTION FOR SIX MONTHS.

[illegible] San Francisco, Cal. [illegible]

[illegible]—ATTACHMENT FOR ADJUSTING CORDS FOR HANGING PICTURES, etc.—[illegible], San Francisco, Cal. March 31, 1869.

[illegible]—APPARATUS FOR MEASURING LIQUIDS.—G. B. Massey, [illegible] York. March 30, 1869.

[illegible] March 25, [illegible]

[illegible] San Francisco [illegible]

[illegible] MATCH SAFE, etc.—F. de Bowens [illegible]

[illegible] W. L. Barton [illegible] Va. March [illegible]

920.—MECHANISM FOR WORKING ORDNANCE.—J. B. Eads, St. Louis, Mo.

[illegible] Baltimore, Md.

[illegible]—Gustav [illegible] New York city. March [illegible]

[illegible] New York city. March 30, 1869.

[illegible] and H. A. House, Bridgeport [illegible]

[illegible].—DISTILLING HYDROCARBON OILS.—Henry Grogan, Flatbush, N. Y. March 30, 1869.

[illegible]—SEWING MACHINE TABLE.—Singer Manufacturing Co. (Incorporated) [illegible]

[illegible] April 2, 1869.

1,017.—BREECH-LOADING FIREARM.—Everett Boyd and P. S. Tyler, Boston, Mass. April 3, 1869.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per line will be charged.

NEW PUBLICATIONS.

A Handy Book for the Calculation of Strains in Girders and Similar Structures, and their Strength. Consisting of Formulæ and Corresponding Diagrams, with numerous Details for Practical Application, etc., etc. By William Humber, Assoc. Inst. C. E., author of "A [illegible] cal Treatise on Cast and Wrought Iron Bridge Construction," etc., etc. New York: D. Van Nostrand, Publisher, Nos. 23 Murray and 27 Warren streets.

The scope of this work is to give, in a concise and convenient form, formulæ for bridge and girder calculations, without giving more than is absolutely [illegible] olution of practical problems. A prom [illegible] to such calculations, involving only the use of the parabola and [illegible] The work is a small octavo, and very conveniently arranged for reference, with numerous illustrations of joints for timber and iron structures, various sections of girders, etc., etc. We have not found time to examine minutely the various formulæ given, but the work is undoubtedly a valuable publication.

Transactions of the Wisconsin State Agricultural Society. With the Report of the State Horticultural Society and Condensed Reports on the International Exhibitions of 1862 and 1867. Vol. VII., from 1861 to 1868, inclusive. Prepared by J. W. Hoyt, Secretary.

We are in receipt of the above volume by the courtesy of Secretary Hoyt, and find therein much interesting matter, some extracts from which we will, in good time, lay before our readers.

Primeval Man. An Examination of some Recent Speculations. By the Duke of Argyll. George Routledge & Sons, No. 416 Broome street, New York city.

The author of this work is doubtless one of the ablest thinkers in Europe, and he has already given practical evidence of his ability in book making by the publication of a work on "The Reign of Law," which has received the commendation of the English press. The present work discusses the origin and antiquity of man and his primeval condition, reviewing the opinion of Sir J. Lubbock upon "The Early Condition of Mankind," and Archbishop Whatley's "Origin of Civilization." It therefore has to deal with questions which touch upon the profoundest problems of our nature and of our history, and is altogether a very interesting and instructive work, one that all may read with profit. Price, $1 50.

We have received from the American Tube Works, Boston, Mass., a very neat specimen of advertising in the shape of a pocket-book, containing mechanical tables of value and other statistical matter, and entitled "Pocket Companion for Mechanics, Machinists, and Engineers." It is bound in morocco, with pockets for bills and papers, and is a very neat [illegible] useful article.

Answers to Correspondents.

CORRESPONDENTS who expect to receive answers to their letters must, in all cases, sign their names. We have a right to know those who seek information from us; besides, as sometimes happens, we may prefer to address correspondents by mail.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisements at $1·00 a line, under the head of "Business and Personal."

☞ *All reference to back numbers should be by volume and page.*

A. H. C., of ——wishes to know the amount of bituminous coal usually consumed in heating one ton of nail plate, we suppose he means during the cutting process: can any of our correspondents give the information?

J. E. B., of Mass.—Congress adopted the meter as a standard of measurement, July 27, 1866.

D. B., of Ca.—The substance used for gumming stamps is gum dextrine. It is applied like other similar substances.

L. V. B., of N. C.—The best thing to remove rust from needles is the common method of scouring them, by sticking them repeatedly in a small bag of fine emery.

G. B. F., of M. T.—We were well aware of the fact that Stringfellow exhibited a small engine at the Aeronautical Society's Exhibition in London, as we noticed it in the Scientific American, at the time, but no such engines can be obtained at the present time. The journal to which you refer is in the habit of taking our replies to correspondents and publishing them as its own.

E. B., of N. C.—There is no machinery in use operating upon the clock principle, that is capable of driving a watchmakers lathe. A small, cheap, and efficient power is much wanted for light work.

APPLICATIONS FOR THE EXTENSION OF PATENTS.

Machine for Engraving Calico Printers' Rolls.—John Hope and Thomas Hope, of Providence, R. I., has applied for an extension of the above patent. Day of hearing, Aug. 2, 1869.

Sewing Machines.—James Harrison, of Jamestown, N. Y., executor of the Estate of James Harrison, Jr., deceased, has applied for an extension of the above patent. Day of hearing July 12, 1869.

Straw Cutters.—D. C. Cumings, of Smithville, N. J., has petitioned for [illegible] nsion of the above patent. Day of hearing, July 19, 1869.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

Brake and Horse Holder.—G. B. Douglas, Sedalia, Mo.—This invention has for its object to furnish an improved brake, which shall be so constructed and arranged as to be self-locking, and at the same [illegible] horse holder for checking the horses should they start wh [illegible]

Sled Runner.—G. W. Hatch, Parkman, Ohio.—This in [illegible] object to furnish an improved sled or sleigh runner, which shall be cheaper in construction, stronger, and more durable than the runners constructed in the ordinary manner.

Churning Apparatus.—S. S. Allen, Belvidere, N. Y.—This invention has for its object to furnish an improved apparatus for operating a churn, which shall be so constructed and arranged as to do its work quickly and thoroughly, bringing the butter in a very short time.

[illegible] Calvin Taylor, Handsborough, Miss.—This invention has for its object to furnish an improved machine for carrying logs, which shall be so constructed and arranged that a much greater amount of lumber may be carried with the same team than can be carried in any of the ordinary modes.

Heater.—Michael Lehmer, Oregon, Mo.—This invention has for its object to furnish an improved heater, which shall be so constructed and arranged as to furnish a large amount of heating surface, so as to utilize all the heat from the products of combustion before they pass off into the [illegible]

Fire Grate.—[illegible] This invention has for its object to improve the construction of fire grates, in such a way that [illegible] grate is agitated, the ashes may be shaken down from above the entire surface [illegible], instead of being displaced only around the edges of the grate, as is the case with grates constructed in the ordinary manner.

[illegible] N. Y.—The object of thi[illegible] effecting so [illegible] preform their respective [illegible] affecting the operation of the other check valves or relief valves with the same pipe but different press.

Lamp.—Solomon P. Smith, Waterford, N. Y.—[illegible] is to provide for publ[illegible] safe combustion, the parts which create and sustain the blast being so constructed as to operate without any of that disagreeable rattling and clattering that has heretofore prevented lamps constructed on the blast principle from coming into general use.

[illegible]

Horse Hay Fork.—Samuel T. Nigh, Leitersburg, Md.—This invention [illegible] in combining with the two tines of a horse hay fork, a certain [illegible] curved bar and a certain central key rod in such manner as that [illegible] a handle for forcing the other into the hay.

Horse Hay Rake.—S. P. Smith, Waterford, N. Y.—This invention relates to that class of horse hay rakes in which wooden teeth are employed, and its object is to construct the rake in such a manner as to render it more [illegible] ties of the ground and the character of [illegible]

[illegible] L. Morrison and A. G. Harms, Allegheny City, Pa.—This [illegible] to certain improvements in the manner of hanging and adjusting reciprocating saws, so that the same will operate and be regulated with ease and without any difficulty. The invention consists in providing [illegible] the purpose of giving [illegible] less throw; also, in making the [illegible] the lower saw [illegible] be more or less far apart from the lower [illegible]

[illegible] F. C. Richer, [illegible], Texas.—This invention relates to a new buckle, which does not require to be sewed to either of the straps which it is to connect and which will [illegible] hands in any [illegible] which has four transverse slots, with teeth on the inner cross bars, and in providing a buckle with slotted end bars, that is to say, with horizontal apertures through the ends, through which the strap to be held is passed.

[illegible] from Printed Paper New Plates [illegible] Charles [illegible] and Christian Kugl, New York city.—The [illegible] to devise a method for producing printing [illegible] printed paper so that by means of such blocks, or plates, the design on the paper can be reproduced or reprinted on other paper or fabric. By this method, old, valuable, and difficult engravings, can, from single specimens, be transferred to metal plates and be copied with great accuracy. A new branch of industry will thus be established and the productions of renowned artists will become accessible to all.

Pastry Rolling Machine.—G. Goodwin and C. H. Bennett, 2d, South Berwick, Me.—This invention relates to improvements in apparatus for rolling dough into thin sheets for pie crust, and also laying it upon the top of a pie or in a vessel, as may be required.

Envelope Opener.—W. H. Mantz, Centralia, Ill.—This invention relates to a new instrument for opening envelopes and for removing letters therefrom. The invention consists of three plates, united by a common pivot, the two outer plates being furthermore connected by rivet or otherwise so that they cannot turn separately on the pivot, while the middle plate which carries the cutter can be swung out to allow the sharpening of the tool. The outer plates may be extended beyond the cutting plate to form a pair of clamps for grasping a letter and withdrawing it from an opened envelope.

Monkey Wrench.—F. C. Richer, Gilmer, Texas.—This invention relates to a new monkey wrench, which is operated by turning the handle, and has for its object to arrange as few parts in as simple a manner as possible, so that the device will be substantial and not apt to get out of repair. The invention consists [illegible] swiveling the handle to the shank of the lower jaw, and in screwing it upon the screw shank of the upper jaw so that it will, when turned, cause the lower jaw to move longitudinally in the desired direction. The shank and body of the lower jaw are hollow and fit upon the polygonal upper part of the upper jaw shank, so that they cannot turn with the handle but merely move longitudinally.

Brick Machines.—Asa Morgan, Cedar Bayou, Texas.—This invention relates to improvements in brick machines, whereby it is designed to provide a simple and effective machine that can be constructed cheaply. It consists mainly in the arrangement of the presses and the slide for delivering the filled molds, and the means of operating them.

Looms.—Wm. Rossiter, Accrington, England.—The object of this invention is to provide an improved arrangement of means for changing self actingly the shuttle in which the weft is broken or absent for another shuttle with the weft ready for weaving without stopping the loom.

Beehives.—H. P. Starbuck, Gallatin, Mo.—This invention consists in making the separate frames, with which the interior of a beehive is sometimes provided for the attachment of single combs, with zinc sides, for the purpose of keeping the combs cool; also in providing the entrance with a protector for the purpose of excluding drones, and arranging swing [illegible] lets in said protector for the purpose of letting drones out that may have gained access; also in a peculiar construction of moth traps; and also in inclining the bottom of the main compartment and providing it with an orifice covered with a wire screen through which the litter of the hive may escape.

Mill Bushes and Spindles.—John Williams, Sullivan, Ill.—This invention relates to improvements in mill bushes and spindles having for their object to provide an improved arrangement for tightening and lubricating the bearing surfaces of the spindle and the boxes.

Bearings for Vertical Shafts.—E. A. Dayton, Richmond, Va.—This invention relates to improvements in bearings for vertical shafts, designed to be applied either as steps for the ends of the shafts, or intermediate bearings, which said bearings are especially adapted to facilitate the lubrication of the shafts.

Churn Dashers.—Jas. M. Buchanan, Lawrenceville, Ill.—This invention relates to improvements in churn dashers, such as are used with the common hand-dasher churns, and consists in the construction of the same, in a manner calculated to produce greater agitation of the cream.

Feed-Cutting Attachment for Thrashing Machines.—G. W. Lee, Sandy, Ohio.—This invention relates to improvements in feed cutting apparatus, designed to provide a simple, cheap, and effective apparatus adapted for attachment to thrashing machines, and operated in combination therewith, in a manner to accomplish the work faster and in a better manner than can be done by cutting apparatus now in use.

Sadiron.—Mrs. Julie Dittrich, Hoboken, N. J.—The object of this invention is to construct a sadiron with a handle that can be readily removed, and with a shield by which the heat ascending from the iron is deflected away from the hand of the person using it. The invention consists in a novel manner of arranging a removable handle on the supports that project from the iron, and also in a novel method of suspending the shield from the said removable handle.

Uterine Supporters.—E. J. Fraser, M. D., Erie, Pa.—This invention consists in forming and applying a bell-shaped metallic ring, with supporting bows attached thereto, which ring is inserted and placed so that the base of the uterus is supported by, and rests within the ring.

Rotary Steam Engine.—Alphens C. Gallahue, Morrisania, N. Y.—This invention consists in so constructing and arranging the parts that a continuous action of the steam upon the piston is obtained, and a uniform rotary motion is produced on the main shaft.

Spittoon Footstool.—John N. Morrison, Philadelphia, Pa.—This invention consists in forming a footstool with a hinged cover and so as to inclose a spittoon.

[illegible] A. Young, [illegible] relates to a new and useful improvement in [illegible] whereby they are reduced to their proper and legitimate func[illegible] amusement and exercise for children and youths as well as for "children of a larger growth," adapting it for play grounds, lawns, gardens, and play rooms.

Automatic Cock for Filling Bottles.—E. Jeanjaquet, New York city.—This invention relates to a new and useful improvement in the method [illegible] pes, hogsheads, or other [illegible] operation of drawing off the liquid contents of such barrels or vessels into bottles of other vessels is greatly facilitated.

[illegible]

[illegible] C. Smith, Brooklyn, N. Y.—This invention relates to [illegible] important improvement in the method of operating velocipedes, whereby they are propelled with greater ease, and whereby the limbs and muscles of the body are more generally brought into action than by any velocipede now in use.

Milking Stool.—Chas. F. Poll[illegible] and [illegible], Theresa, N. Y. [illegible] pail, and also for holding the tail of the cow [illegible] from annoying the person milking, by switch [illegible]

Regulating Mast Hoops on Vessels.—Joseph Conway, Harrison, Md.—The object of this invention is to provide a cheap and simple device, which will prevent mast hoops from catching on the mast, and which will, by [illegible] slide smoothly up and down, greatly diminish the labor required to hoist and take in sail in fore-and-aft rigged vessels.

Pianofortes.—Daniel Stira, Milwaukee, Wis.—In this invention a new form of sounding board and cast-iron frame, and a new arrangement of the sounding board with relation to the cast-iron frame, the strings, and the supports and fastenings for the latter, are employed for the purpose of giving greater volume, purity, sweetness, and brilliancy to the tone.

Gas Generator.—Josiah Jonson, Toledo, Ohio.—The object of this invention is to provide for public use a cheap, convenient, and substantial [illegible] the action of which can be so adjusted and controlled as to present a greater or less carburetting surface to the air, whereby the latter can be combined with any required proportion of inflammable vapor without changing the draft or quantity of air.

Paint Brushes.—F. P. Furnald, Jr., New York city, R. W. Champion, Brooklyn, N. Y., and I. N. Davies, Bergen City, N. J.—The object of this invention is to provide a more durable and economical connection of the handles and bushes of paint and other similar brushes than is afforded by the present construction.

Hay Elevating Apparatus.—O. F. Ma[illegible], N. Y.—This invention relates to impr[illegible] apparatus for [illegible] hay and delivering it on to the bay, and consists of a tackle block, so formed that when the fork in its upward movement arrives at the said block from which it is suspended, the latter will become detached from its suspending device and permit the load to fall in a lateral direction upon the bay.

Cultivator.—J. M. Culver, Gilbertsville, Iowa.—This invention relates to improvements in cultivators, the object of which is to provide a light hand implement for garden use.

Screw Propellers.—Henrietta Vansittart, Richmond, England.—The object of this invention is to economize the power required in driving steam propellers for ships, or other vessels. This is effected by so modifying the form of the blades of screw propellers as to cause them to act more effectually on the water and to prevent them from "churning" or uselessly stirring the water near the center of motion. The invention consists in an improved mode of determining the proper curvature of the blades, and of forming the said curves.

Starting and Stopping Cars.—G. W. Davis and Albert E. Smith, Providence, R. I.—The object of this invention is to provide a simple and effective means for stopping and starting railroad cars. It is designed more particularly for street cars, but the stopping device is also applicable to steam cars.

Neck Pad for Horses.—C. J. Fisher, Waukon, Iowa.—This invention relates to a new device for protecting the necks of horses between the upper ends of the collar, to prevent galling. For this purpose pieces of leather, cloth, or other material have heretofore been used, but without the desired success. Pads could not be made, as their inner faces could not be kept clear from wrinkles or protuberances, which are more injurious than the [illegible]

Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING MAY 4, 1869.

Reported Officially for the Scientific American.

SCHEDULE OF PATENT OFFICE FEES

[illegible]

[illegible] MUNN & CO., Patent Solicitors, No. 37 Park Row, New York.

89,516.—Corn Harvester.—[illegible]

89,517.—Potato Digger.—[illegible]

89,518.—[illegible] for Spinning Machines.—[illegible]

89,519.—[illegible] Furnace.—[illegible]

89,520.—Corn Sheller.—[illegible], Augusta, Ga.

89,521.—[illegible]

89,522.—[illegible] Machine.—[illegible]

89,523.—[illegible] Window [illegible]—Edward [illegible]

89,524.—[illegible]

89,525.—[illegible]

89,526.—Machine [illegible] for Planing.—[illegible]

89,527.—[illegible]

89,528.—[illegible] Machine.—[illegible]

89,529.—[illegible]

89,530.—[illegible] Tobacco [illegible]

89,531.—[illegible] Mechanism in [illegible]

89,532.—Metal [illegible] Compound.—[illegible]

89,533.—[illegible]

89,534.—Fastening [illegible]

89,565.—Plow.—J. M. Dormon, Claiborne Parish, La.
89,566.—Automatic Fan.—J. R. Dunn, Queens county, and G. B. Burroughs, Brooklyn, N. Y.
89,567.—Toy Velocipede.—Elijah Eaton, Hartford, Conn.
89,568.—Freeing Tool, Screw, and Jewel Setter Combined.—C. E. Evard, Leesburg, Va.
89,569.—Combined Measure and Funnel.—Joseph Fanyon, Providence, R. I.
89,570.—Device for Fastening Wagon Seats.—J. H. Fellows, Alba, Pa.
89,571.—Potato Digger.—W. A. Field, Schuylkill Haven, Pa.
89,572.—Wash Boiler.—Stephen Fisk, Winchester, Ind.
89,573.—Holdback.—W. Garrison and C. H. Stevens, Syracuse, N. Y. Antedated Dec. 8, 1868.
89,574.—Enameling Stone and Earthenware.—J. H. Giles, New York city.
89,575.—Wrench.—John Goodin, Centralia, Ill.
89,576.—Whip Socket.—G. H. Gregory, North Milton, Conn.
89,577.—Floor Clamp.—J. A. Hasse, Philadelphia, Pa.
89,578.—Automatic Switch.—Samuel Hodkinson, Louisville, Ky.
89,579.—Flux for Extracting Precious Metals from their Ores.—W. W. Hubbell, Philadelphia, Pa.
89,580.—Automatic Feed Regulator for Lamps.—H. S. Hudson, Selma, Ala.
89,581.—Governor for Steam Engines.—R. K. Huntoon (assignor to himself and J. A. Lynch), Boston, Mass.
89,582.—Compound of Ivory Dust and other Materials.—J. W. Hyatt, Jr., Albany, and David Blake, Spencertown, N. Y.
89,583.—Watch-winding Device.—Isaac Ickelheimer, New York city.
89,584.—Mode of Guiding Velocipedes on a Single Track.—J. H. Irwin, Philadelphia, Pa.
89,585.—Sun Dial.—John Johnson, Saco, Me.
89,586.—Locking Nut.—C. F. Keller (assignor to himself, Wm. Balliet, and H. A. King), Nevada, Ohio.
89,587.—Sash Lock.—Geo. King, Frederick, Md.
89,588.—Apparatus for Making Illuminating Gas from Gasoline.—H. S. Maxim and Jas. Radley, New York city.
89,589.—Corn Separator.—E. McLane, Young America, Ill.
89,590.—Machine for Washing Hides and Leather.—H. N. Meeker, Smith's Mills, N. Y.
89,591.—Wash Boiler.—C. E. Miller, Indianapolis, Ind.
89,592.—Staddle Pipe for Hydraulic Gas Mains.—Peter Munzinger, Philadelphia, Pa.
89,593.—Forming Machine for Square Tin Cases.—J. H. Murrill (assignor to Murrill & Keizer), Baltimore, Md.
89,594.—Inhaling Apparatus.—E. W. Owen, Brooklyn, N.Y.
89,595.—Steam Generator.—W. S. Page and Richard East, Nine Elms Wharf, Nine Elms, England.
89,596.—Door Key.—Emery Parker, New Britain, Conn.
89,597.—Spinning Frame.—Samuel B. Parmenter, Lewiston, Me.
89,598.—Apparatus for Conveying Screw Blanks.—E. S. Pierce (assignor to National Screw Company) Hartford, Conn.
89,599.—Metal Binding for Oilcloth, Carpet, etc.—John Piper, Utica, N. Y.
89,600.—Lamp.—J. F. Sanford, Keokuk, Iowa.
89,601.—Hat-blocking Machine.—Julius Sheldon, New York city.
89,602.—Axle Skein.—Gottlieb Schreyer, Columbus, Ohio.
89,603.—Horse Hay Fork.—R. A. Smith, Washington Mills, N. Y.
89,604.—Carriage-sash Fastener and Supporter.—Wm. Stewart, Hartford, Conn.
89,605.—Horse Rake.—Sumner Stoughton, Windsor, Ohio, assignor to himself and Leverett Grover.
89,606.—Seeding Machine.—John H. Stringfellow, Richmond, Va.
89,607.—Toy Gun.—C. B. Thayer, Syracuse, N. Y.
89,608.—Plow.—S. R. Thompson (assignor to himself and Joseph Pinkham), New Market, N. H.
89,609.—Grinding Mill.—Almon Thwing, Hopedale, and C. H. Fowler, West Roxbury, Mass.
89,610.—Hot-air Furnace.—W. D. Titus, Brooklyn, N. Y.
89,611.—Machine for Raking and Cocking Hay.—Joseph Wadleigh, Chebanse, Ill.
89,612.—Cotton-bale Tie.—J. S. Wallis, New Orleans, La.
89,613.—Culinary Apparatus.—Benjamin Wardwell, Providence, R. I.
89,614.—Draft Equalizer.—S. H. Wheeler, Dowagiac, Mich.
89,615.—Root Digger.—Baxter Wright, Cardiff, N. Y.
89,616.—Churn.—S. S. Allen, Belvidere, N. Y.
89,617.—Method of Controlling the Flow of Liquids under Pressure.—J. S. Baldwin, Newark, N. J.
89,618.—Needle Setter and Thread Pincer.—C. T. Barber and R. T. Loomis, New York city.
89,619.—Hay Rack.—Angeline Bayley, Battle Creek, Mich., administratrix of the estate of A. C. Bayley, deceased.
89,620.—Metallurgic Furnace.—A. G. Bevin, East Hampton, Conn.
89,621.—Spring.—H. N. Black, Philadelphia, Pa.
89,622.—Book Binding.—W. I. Blackman, Columbus, Miss.
89,623.—Machine for Swaging Ax Polls.—R. Blake and Asael Carpenter, Scranton, Pa., assignors to Robert Blake.
89,624.—Machine for Trimming Cue Leather.—J. E. Boyle, New York, N. Y.
89,625.—Adjustable Center Square.—W. H. Brock (assignor to himself and C. H. Hustoon), Bridgeport, Conn.
89,926.—Animal Trap.—Elisha Brown, Wayne, Mich.
89,627.—Miter Machine.—J. H. Brown, Brockport, N. Y.
89,628.—Caster.—Myron S. Brownell, Adrian, Mich.
89,629.—Churn Dasher.—J. M. Buchanan, Lawrenceville, Ill.
89,630.—Drain Pipe.—Stephen Carlton, Lynn, Mass.
89,631.—Upsetting Machine.—E. R. Carter, Medina, and C. D. W. Gibson, Bay City, Mich.
89,632.—Balance Line for Mast Hoops.—Joseph Conway, Harrison, Md.
89,633.—Boot Jack.—Patrick Cullen, Bridgeport, Conn.
89,634.—Garden Cultivator.—J. M. Culver, Gilbertsville, Iowa.
89,635.—Steering Apparatus.—G. H. Davis, Stony Brook, N. Y.
89,636.—Car Starter.—G. W. Davis, and A. E. Smith, Providence, R. I.
89,637.—Bearing for Vertical Shafts.—E. A. Dayton, Richmond, Va.
89,638.—Sadiron.—Julie Dittrich, Hoboken, N. J.
89,639.—Brake for Wagons.—G. B. Douglas (assignor to himself, and J. H. Scheer), Sedalia, Mo.
89,640.—Boot Crimping Machine.—W. R. Dunn, Alton, Ind.
89,641.—Key Fastener.—R. S. Danning, Fall River, Mass.
89,642.—Manufacture of Metal Ornaments.—F. J. Emery, Chicago, Ill.
89,643.—Fanning Mill.—LeRoy Farnham and John Mosher, Delta, Mich.
89,644.—Beehive.—J. E. Finley, Memphis, Tenn.
88,645.—Churn.—J. E. Finley, Memphis, Tenn.
89,646.—Neck Pad for Horses.—C. J. Fisher, Waukon, Iowa.
89,647.—Uterine Supporter.—E. J. Fraser, Erie, Pa.
89,648.—Apparatus for Treating Diseases by Vacuum.—T. Fravel, Westville, Ind.
89,649.—Paint Brush.—F. P. Furnald, Jr., New York city, R. W. Champion, Brooklyn, N. Y., and L. N. Davies, Bergen City N. J.
89,650.—Rotary Steam Engine.—A. C. Gallahue, Morrisania, N. Y., assignor to himself and David Gillespie, New York city.
89,651.—Spring Bed Bottom.—G. L. Gerard, New Haven, Conn., assignor to himself, T. B. Carpenter, and J. E. Carpenter.
89,652.—Self-oiling Pulley.—J. Goodrich and H. J. Colburn (assignors to Rollstone Machine Works), Fitchburg, Mass.
89,653.—Dough Rolling Machine.—Harmon Goodwin and Chas. H. Bennett, M, South Berwick Junction, Me.
89,654.—Medicated Cracker.—J. L. Halliman, Grand Rapids, Mich.
89,655.—Cooking Stove.—Robert Ham, Troy, N. Y.
89,656.—Hydraulic Press.—Thos. Harbottle, Brooklyn, N.Y.
89,657.—Water Wheel.—Wm. Haslup, Sydney, Ohio.
89,658.—Sleigh Runner.—G. W. Hatch, Parkman, Ohio.
89,659.—Nut-lock for Fish Plates.—J. W. Hazelton and A. A. Southard, Drayton Plains, and Oliver Merwin, Elba, Mich.
89,660.—Stovepipe Thimble.—G. W. Helt, Alma, Mich.
89,661.—Potato Digger.—T. N. Henderson, Jackson, Mich.
89,662.—Pump.—D. P. Henry, Windsor, Ill.
89,663.—Propelling Boats.—Joseph Heroux, St. Paul, Minn.
89,664.—Bottle Filler.—E. Jeanjaquet, New York city.
89,665.—Apparatus for Carbureting Air or Gas.—Josiah Janson, Toledo, Ohio.
89,666.—Ear for Water Pails.—J. G. Krichbaum, Youngstown, Ohio.
89,667.—Device for Setting the Hands of Watches.—A. Lange, Glashette, Saxony.
89,668.—Truss Supporter.—D. S. Leavitt, Grand Rapids, Mich.
89,669.—Feed Cutting Attachment for Thrashing Machines.—G. W. Lee, Sandy, Ohio.
89,670.—Coal Stove.—Michael Lehmer, Oregon, Mo.
89,671.—Vise.—J. H. Lewis, Duxbury, Mass.
89,672.—Pump.—J. H. Luddington, Bridgeport, Conn.
89,673.—Apparatus for Elevating Hay.—O. E. Mable, Camden, N. Y.
89,674.—Gate for Water Wheels.—T. W. Mahler, Rome, N. Y.
89,675.—Envelope Opener.—W. H. Mantz, Centralia, Ill.
89,676.—Ditching Machine.—W. D. McKinney, Marion, Ind.
89,677.—Non-freezing Rain Lead.—J. F. McNee (assignor to himself, and Martin McNee), Philadelphia, Pa.
89,678.—Horse Power.—C. L. Merrill, Watertown, N. Y.
89,679.—Velocipede.—H. T. Metzgar, Salem Cross-Roads, Pa.
89,680.—Brick Machine.—Asa Morgan, Cedar Bayou, Texas.
89,681.—Muley Saw Mill.—L. Morrison, and A. G. Harms, Allegheny City, Pa.
89,682.—Spittoon Footstool.—J. N. Morrison, Philadelphia, Pa.
89,683.—Horse Hay Fork.—S. T. Nigh, Leitersburg, Md., assignor to himself, J. W. Nigh, and Upton Bell.
89,684.—Milking Stool.—C. F. Pollock and Nicholas Trickey, Theresa, N. Y.
89,685.—Apparatus for Tempering Clay.—L. E. Ransom, Trenton, Mich.
89,686.—Fire Escape.—E. P. Richardson, Manchester, N. H.
89,687.—Tool for Turning Centers.—H. D. Richardson (assignor to himself and J. W. Wilson), East Hampton, Mass.
89,688.—Tool Holder.—H. D. Richardson (assignor to himself and J. W. Wilson), East Hampton, Mass.
89,689.—Buckle.—F. C. Richer, Gilmer, Texas.
89,690.—Wrench.—F. C. Richer, Gilmer, Texas.
89,691.—Railway Switch.—Andrew Rosewater, Omaha, Nebraska.
89,692.—Loom.—Wm. Rossetter, Accrington, England.
89,693.—Jacket for Fireplace Heater.—Watson Sanford, Brooklyn, N. Y.
89,694.—Power Loom for Weaving Carpets, etc.—Halcyon Skinner (assignor to Alex. Smith), Yonkers, N. Y.
89,695.—Velocipede.—John C. Smith, Brooklyn, N. Y.
89,696.—Lamp.—S. P. Smith, Waterford, N. Y.
89,697.—Horse Rake.—S. P. Smith, Waterford, N. Y.
89,698.—Stove Drum.—F. Stadter, Plattsmouth, Nebraska.
89,699.—Breech-loading Firearm.—A. C. Stevens, Hudson, N. Y.
89,700.—Circular Velocipede.—G. J. Sturdy and S. W. Young, Providence, R. I.
89,701.—Heat Radiator.—D. F. Sweet, Otsego, assignor to himself and Reuben Sweet, Kalamazoo, Mich.
89,702.—Wrench.—G. C. Taft (assignor to Loring Coes), Worcester, Mass.
89,703.—Truck for Carrying Logs.—Calvin Taylor, Handsborough, Miss.
89,704.—Mode of Putting up Caustic Soda for the Manufacture of Soap.—T. C. Taylor, Philadelphia, Pa.
89,705.—Magazine Firearm.—L. Z. Terril, Chicopee, Mass.
89,706.—Steam Heating Device.—J. B. Terry, Brooklyn, N. Y.
89,707.—Lamp Shade.—G. W. Tucker, Waterbury, Conn.
89,708.—Attaching Knobs to their Spindles.—H. B. Tuthill, New York city, assignor to himself, M. C. Ogden, and W. Slawson.
89,709.—Preparation of Glue Stock and other Products from Animal Substances.—D. K. Tuttle, and Orazio Lugo, Baltimore, Md.
89,710.—Combined Seed Sower and Harrow.—Myron Vandeusen, Oxford, Mich.
89,711.—Washing Machine.—J. D. VanDusen, Auburn, N.Y.
89,712.—Method of Construction for Screw Propellers.—Henrietta Vansittart Richmond, England.
89,713.—Oven.—John Vatter, Phillipsburg, Ohio.
89,714.—Low-water Indicator.—W. W. Virdin, Baltimore, Md.
89,715.—Method of Producing from Printed Paper New Plates for Reprinting.—Charles Vogt and Christian Vogt, New York city.
89,716.—Cistern.—John J. Walker, Ann Arbor, Mich.
89,717.—Steam Enginery for Seine Hauling.—Peter M. Warren, Edenton, N. C.
89,718.—Drive Well Point.—Devolson Weaver, Anamosa, Iowa.
89,719.—Match Box.—Horace J. Wickham, Manchester, Conn.
89,720.—Fire Grate.—George Williamson, Sullivan, Ill.
89,721.—Mill Brush and Spindle.—John Williams, Sullivan, Ill.
89,722.—Pea Dropper.—A. J. Williams, Barnesville, Ga.
89,723.—Combined Lifting Jack and Wrench.—Richard A. York, Reading, Mich.
89,724.—Machine for Grinding Saws.—E. L. Abbott, Jamison H. Harrison, and W. P. Welch, Boston, Mass., assignors to E. L. Abbott; said Abbott assigns to himself and S. A. Woods.
89,725.—Device for Preventing Incrustation in Boilers.—Thomas Barfield, Athens, Ill.
89,726.—Wash Boiler.—Charles R. Arnold, Hamilton, Ill.
89,727.—Waterproof Coating for Various Purposes.—Emile Victor Audibert, New Orleans, La.
89,728.—Seeding Machine.—Henry Bean, Schuylkill, Pa.
89,729.—Corn Cultivator.—Solyman Bell and George W. Bronson, La Salle county, Ill.
89,730.—Harvester.—Henry Brackett, Valley Falls, N. Y.
89,731.—Harvester Rake.—Henry Brackett, Valley Falls, N. Y.
89,732.—Harvester Dropper.—Henry Brackett, Valley Falls, N. Y.
89,733.—Dropper for Harvesters.—Henry Brackett, Valley, Falls, N. Y.
89,734.—Self-discharging Blanket Ore Concentrator.—John M. Bryan, Lincoln, Cal.
89,735.—Pattern, Measuring, and Laying out Ladies' Dresses.—H. M. Burrows, Norwich, N. Y.
89,736.—Spring Seat for Chairs, Wagons, Cars, etc.—William Carr (assignor to himself and Charles P. Ford), St. Louis, Mo.
89,737.—Machine for Making Horseshoes.—James Christie, Pittsburg, Pa.
89,738.—Preparation of Copying Paper.—Charles Cowan, New York city.
89,739.—Seed Sower.—George H. Crocker, Marysville, assignor to himself and David L. Smith, San Francisco, Cal.
89,740.—Feather Renovator.—John Cyester, Osborn, Ohio.
89,741.—Sash Holder.—Addison Davis, Boston, Mass.
89,742.—Corn Dropper.—Loyal M. Doddridge, Henry Reitenour, and Jacob B. Swbier, New Mount Pleasant, Ind.
89,743.—Cap for Lamp Chimney.—Jules George Dreyfus, New York city.
89,744.—Velocipede.—L. E. Dugas, Warren, Ill.
89,745.—Bridge.—James B. Eads, St. Louis, Mo.
89,746.—Lock.—John Ebling, New York city.
89,747.—Stop Watch.—Henri Robert Ekegren, Geneva, Switzerland.
89,748.—Process of Ageing Liquors and Spirits, and for Producing Aromatic Ethers.—Charles Louis Fleischmann, Washington, D. C.
89,749.—Distilling Apparatus.—Charles Louis Fleischmann, Washington, D. C.
89,750.—Process of Extracting Oil from Cotton Seeds.—Charles Louis Fleischmann, Washington, D. C.
89,751.—Cotton Gin.—Charles Louis Fleischmann, Washington, D. C.
89,752.—Railway Car Wheel.—Addison C. Fletcher, New York City.
89,753.—Door Lock.—Monroe B. Foote, Northampton, Mass., assignor to himself, William M. Gaylord, and E. N. Foote.
89,754.—Edge Plane for Boots and Shoes.—Philander S. Foster, Richmond, Me.
89,755.—Bit Stock.—Dan P. Foster, Waltham, Mass.
88,756.—Refrigerator.—George A. Fountain, Newark, N. J.
89,757.—Electro-magnetic Temperature Alarm.—J. B. N Fournier and C. A. Lemaire, Paris, France.
89,758.—Apparatus for Changing Car Trucks.—S. L. Fremont, Wilmington, N. C.
89,759.—Carriage Step and Wheel Fender.—John W Gosling, Cincinnati, Ohio.
89,760.—Rocking Chair.—Carl Julius Graf, Chicago, Ill.
89,761.—Washing Machine.—Abraham Havens, Trenton, N. J.
89,762.—Alarm Lock.—Edward Herbster, Chicago, Ill.
89,763.—Method of Constructing Piles for Beams.—Charles Hewitt, Trenton, N. J.
89,764.—Device for Bending Plow Handles.—William Heylman, Peoria, Ill.
89,765.—Rock Breaker.—Alonzo Hitchcock, New York city.
89,766.—Fourdrinier Paper Machine.—Carl Hofmann, Elkton, Md.
89,767.—Divided Axle for Railway Cars.—David Brown Hunt, San Francisco, Cal.
89,768.—Compound Fabrics for the Production of Shirt Collars.—Walter Hunt, New York city, assignor, by mesne assignments to William E. Lockwood, Philadelphia, Pa.
89,769.—Hedge Trimmer.—S. T. Hyde, Pinna, Ill.
89,770.—Lantern.—John H. Irwin, Chicago, Ill.
89,771.—Coal Scuttle.—John William Jarboe, Brooklyn, (E. D.), N. Y.
89,772.—Suspender.—Ebenezer Jennings, Jr., New York city.
89,773.—Trunk Clamp.—Wm. S. Jessup, Newark, N. J.
89,774.—Horseshoe.—Jonathan Johnson, Lowell, Mass.
89,775.—Horseshoe.—Jonathan Johnson, Lowell, Mass.
89,776.—Sofa, Lounge, and Table.—William B. Jones, Cincinnati, Ohio.
89,777.—Propellor.—A. C. Loud, San Francisco, Cal
89,778.—Scythe.—William Lowden, Thornapple, Mich.
89,779.—Seat for Parks and Gardens.—Samuel Macferran, Philadelphia, Pa.
89,780.—Governor for Steam and Other Enginery.—J. Avery Marden (assignor to George M. Gibson and Thomas A. Johnston), Boston, Mass.
89,781.—Stop Valve.—Benj. G. Martin, New York city.
89,782.—Fireproof Building.—Edwin May, Indianapolis, Ind.
89,783.—Velocipede.—S. T. McDougall, Brooklyn, N. Y.
89,784.—Wash Boiler.—Fredrich William Miller, (assignor to Fares and Miller), Cincinnati, Ohio.
89,785.—Weather Strip.—William Miller, Chicopee, Mass.
89,786.—Steam Generator.—John H. Mills, Boston, Mass.
89,787.—Meat Cutter.—D. H. Mundy and H. W. Hoffman, Camden, N. J.
89,788.—Gang Plow.—Maurice Murphy, Vacaville, Cal.
89,789.—Machine for Buffing, Whitening, Glassing, Polishing, and Stoning Leather.—Albert W. Pratt (assignor to himself, William A. Perkins, and David H. Burbank), Salem, Mass.
89,790.—Wood-bending Machine.—Nathaniel Purdy, Milwaukee, Wis.
89,791.—Cultivator.—John A. Quick, South Danville, N. Y.
89,792.—Harvester Dropper.—Amos Rank, Salem, Ohio.
89,793.—Coal Chute.—L. D. Roberts and C. C. Roberts, Cleveland, Ohio.
89,794.—Submarine Drilling Apparatus.—T. F. Rowland, Greenpoint, N. Y.
89,795.—Safety Lamp.—Frank Saunders, Aberdeen, Miss.
89,796.—Side-hill Plow.—Ives Scoville and H. H. Scoville, Oakland, Cal.
89,797.—Gang Plow.—George Seibert and John Seibert, Ashley, Ill.
89,798.—Machine for Skiving and Channeling Soles.—J. B. Sias, Beverly, assignor to H. S. Vrooman, Boston, Mass.
89,799.—Quilting Frame.—W. J. Simmons, Chariton, Iowa.
89,800.—Machine for Desiccating Fertilizers.—Amor Smith, Baltimore, Md.
89,801.—Cultivator.—Philander Sprague, Pecatonica, Ill.
89,802.—Producing Gas for Heating and Lighting.—T. G. Springer, Clinton, Iowa.
89,803.—Mop Holder.—Greenleaf Stackpole, New York city.
89,804.—Skate.—E. T. Starr, New York city.
89,805.—Process of Removing Soluble Matters from Artificial Stone.—E. T. Steen and W. B. May, San Francisco, Cal.
89,806.—Pianoforte.—Daniel Stirn, Milwaukee, Wis.
89,807.—Mule for Spinning.—Albert Stockwell, Providence, R. I., assignor to C. W. Greene, trustee, and said Greene, as trustee, assigns to Albert Stockwell and Winsor Stone.
89,808.—Horse Rake.—H. A. Streeter, Worcester, Mass., assignor to J. P. Streeter and Brother.
89,809.—Locomotive Steam Engine.—J. S. Stuart, Philadelphia, Pa.
89,810.—Horse Hay Fork.—J. B. Sweetland, Pontiac, Mich.
89,811.—Candlestick.—F. A. Taber, Baltimore, Md.
89,812.—Revolving Sulky Harrow and Seeder Combined.—A. L. Taveau, Chaptico, Md.
89,813.—Means for Hanging Window Shades.—J. I. Tay, San Francisco, Cal.
89,814.—Cheese Table, Shelving, etc.—A. M. Utley, Watertown, N. Y.
89,815.—Portable Laundry.—John Van, Cincinnati, Ohio Antedated April 16, 1869.
89,816.—Life Boat.—F. Vie, Havre, France.
89,817.—Combination Lock.—Ephraim Vorbe, San Francisco, Cal.
89,818.—Sole Channeling and Feather-Edging Machine.—H. S. Vrooman, Boston, Mass.
89,819.—Door Catch and Cushion.—Sam'l Wagner, Galion, Ohio.
89,820.—Belt Joint.—Bernard P. Walker, Wolverhampton, England.
89,821.—Sash Balance.—P. A. Wilson (assignor to himself, Matthew Williams, and Albert Atwood), Camden, N. J.
89,822.—Velocipede.—Seth Wilmarth, Malden, Mass.
89,823.—Tire Upsetting Machine.—Albert Winship, Turner, Me.
89,824.—Machine for Cutting Stalks in the Field Preparatory to Plowing.—Reuben Wright, Houston, Texas.
89,825.—Horse Power.—Jas. M. Albertson, New London, Conn.
89,826.—Letter Lock.—H. L. Arnold, Chicago, Ill.
89,827.—Foot Rest for Chairs.—G. L. Badlam and C. W. Lang, Brandon, Vt.
89,828.—Ticket Punch.—John Chapin, Chicopee, assignor to R. H. Smith, Springfield, Mass.
89,829.—Branding Apparatus.—J. Wesley Dodge, Malden Mass.
89,830.—Lock for Prison Doors.—L. M. Thar, Boston, Mass.
89,831.—Apparatus for Rolling and Notching Rails for Railroads.—Wm. Hoffman, Pittsburgh, Pa.
89,832.—Sash Holder.—Bennett Kindblade, Geneva, Ill.
89,833.—Field Skate.—T. L. Luders, Olney, Ill.
89,834.—Hat Press.—G. C. Howard, Philadelphia, Pa. Antedated Nov. 4, 1868.
89,835.—Carriage Wheel.—Virgil Price, New York city.
89,836.—Buckle.—W. M. K. Thornton, Clinton, Wis.
89,837.—Trunk Lock.—Zachariah Walsh (assignor to himself and Cornelius Walsh), Newark, N. J.
89,838.—Washing Machine.—Jacob Weaver, Jr., Pittsburgh, Pa.

90,839.—Journal Box.—Rufus Sibley, Greenville, Conn.

REISSUES.

[illegible].—Machine for Heading Bolts.—Dated January 19, [illegible]; reissue [illegible].—[illegible], Providence, R. I.

22,793.—Cracker Machine.—Dated February 1, 1859; reissue [illegible].—Joseph Fox, Lansingburgh, N. Y.

10,592.—Straw Cutter.—Dated March 7, 1854; reissue 2,202, dated June [illegible]; extended seven years from March 7, [illegible]; reissue [illegible].—[illegible], N. Y.

[illegible].—Method of Making Side Bands of Watch Cases.—Dated June 11, [illegible]; reissue [illegible].—[illegible] and [illegible], Providence, R. I., assignees, by mesne assignments, of [illegible].

74,116.—Lubricator for Loose Pulleys.—Dated February 4, [illegible]; reissue [illegible].—[illegible] and John McCreary, Cohoes, N. Y.

[illegible].—Railway Day and Night Car.—Dated May 19, [illegible]; reissue [illegible], dated September [illegible]; reissue [illegible].—[illegible], Rochester, N. Y., assignee, by mesne assignments, of J. B. Creighton.

61,213.—Combined Latch and Lock.—Dated July 20, 1867; reissue [illegible].—Division [illegible].—[illegible], New York city, for himself, and assignee of J. H. [illegible].

79,929.—Button.—Dated December 31, 18[illegible]; reissue 3,421.—W. E. Reed, New York city, Chairman of Committee on Organization, assignee of D. M. Somers and W. B. Atwood.

13,501.—Machinery for Trimming Books.—Dated August [illegible]; reissue [illegible].—[illegible], Philadelphia, Pa.

87,593.—Machine for, and Method of Compressing Cartridge Shells to a Tapered Form.—Dated March 9, 18[illegible]; reissue [illegible].—[illegible], United States Army.

[illegible].—Hot Air Furnace.—Dated February 2, 1863; reissue [illegible].—[illegible], [illegible].

35,631.—Paint Box.—Dated June 19, 1866; reissue 3,425.—T. B. [illegible], and H. W. Corning, New Britain, Conn., assignees, by mesne assignments, of T. B. Doolittle.

DESIGNS.

[illegible].—[illegible] of a Writing Desk.—[illegible] Beck, Brooklyn, N. Y.

3,470.—Plates of a Cook's Stove.—John Martino, Jacob [illegible], and John Currie, Philadelphia, Pa., assignors to Chas. [illegible] and [illegible] Thomson.

3,471.—Table Caster.—Wm. Parkin (assignor to Reed and Barton), Taunton, Mass.

3,472.—Floor Oil Cloth.—A. E. Powers, Lansingburgh, N. Y.

3,473.—Trade Mark.—C. C. Savery, Philadelphia, Pa.

3,474.—Cook's Stove.—Robert Scorer and Robert Ham (assignors to Cox, Church & Company), Troy, N. Y.

3,475.—Show Case.—M. Terhune, Chicago, Ill., assignor to himself and W. H. Core, New York city.

3,476.—Clock Case.—S. B. Terry, Waterbury, Conn.

3,477.—Floor Oil Cloth.—J. T. Webster, New York, assignor to [illegible] Powers, A. E. Powers, and [illegible] Powers, Lansingburgh, N. Y.

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